APR 29 1921

In This Issue—*Where Shall We Draw the Line on Free Service?*

MOTOR AGE

Vol. XXXIX
Number 17

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CHICAGO, APRIL 28, 1921

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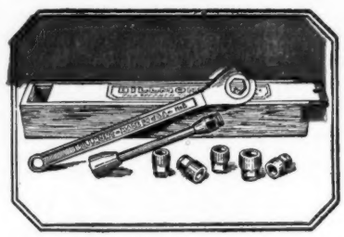

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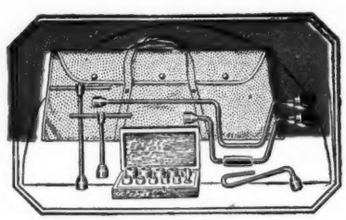

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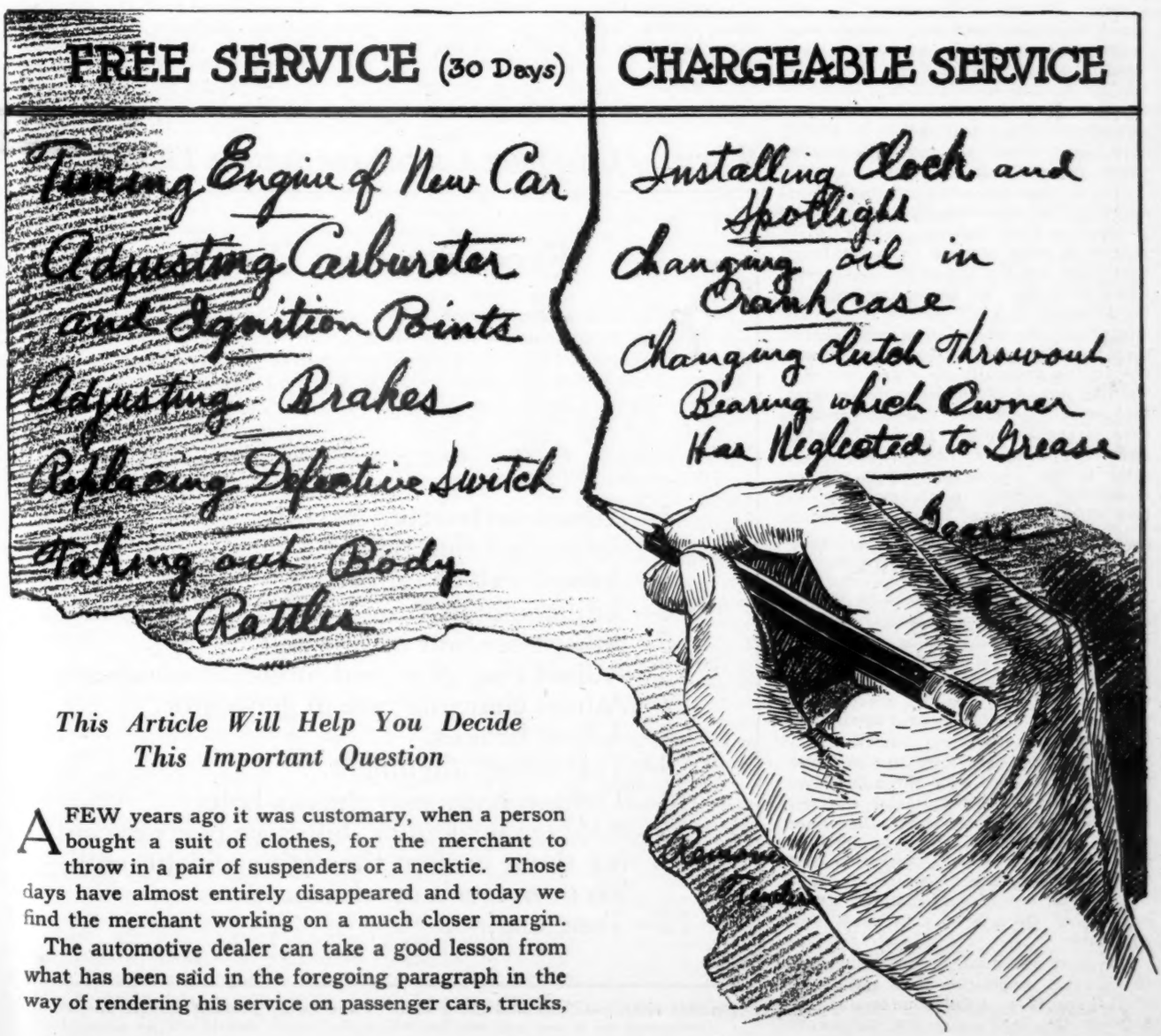
Vol. XXXIX. No. 17 APRIL 28, 1921 $5.00 Per Year

MOTOR AGE

Where Shall We Draw the Line On Free Service?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CHARGEABLE SERVICE
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Changing Oil in Crankcase
Changing Clutch Throwout Bearing which Owner Has Neglected to Grease
Remove Fender

This Article Will Help You Decide This Important Question

A FEW years ago it was customary, when a person bought a suit of clothes, for the merchant to throw in a pair of suspenders or a necktie. Those days have almost entirely disappeared and today we find the merchant working on a much closer margin.

The automotive dealer can take a good lesson from what has been said in the foregoing paragraph in the way of rendering his service on passenger cars, trucks,

DON'T MAKE A MISTAKE LIKE THIS.

You are inviting a lot of trouble for yourself and customer because of the lack of a definite understanding of what you are going to do

tractors, house-lighting plants, or whatever else he sells and services. The idea of an automotive dealer having to give away a lot of service is a hang over from the old days of the automobile business. In the early days the man who went into the automobile business was looked upon as one who merely sold automobiles as a sport. He was not considered operating a legitimate business. People who bought cars, in those days, also were looked upon as sports and, of course, the automobile man and the customer became quite chummy and it was not uncommon with a man who was selling cars to put himself out to a considerable extent to satisfy the car owner.

Special inducements ranging from throwing in an extra tire down to a promise to keep the car running for a year were quite common twelve or fourteen years ago but as the business grew, and it grew fast, the dealer realized that his business was a business much like any other merchants. The wise dealer soon saw that old time methods would not do and gradually we began to see a weeding out of the undesirable customs that were associated with the pioneer days of the business. Those who went after the business energetically soon came to the conclusion that they were absolutely justified in charging for repair work performed on a man's car.

"WHERE SHALL WE DRAW THE LINE ON FREE SERVICE?"

One of the great drawbacks to present day automotive service is the item of Free Service. Many of us say it has been eliminated, but a little investigation and observation at various dealers' establishments, particularly those in the smaller communities, soon reveals that this is not the case.

The question uppermost in the minds of many associated with the automotive industry today is, "Where shall we draw the line on free service?" In other words, when is a dealer justified in charging for a service operation and when is the customer entitled to have work performed without charge? Obviously, this often is a matter of local conditions.

The first essential in analyzing this free service proposition is to make sure that there is a definite understanding between the dealer and the car owner either before or at the time a sale of a new car is made. The greatest mistake the dealer can make is to follow the example of the man shown in the accompanying illustration. Too frequently a dealer is apt to tell the customer too, "Just drive around and we'll fix her up if anything goes wrong."

A statement like this immediately invites trouble for both the dealer and customer. It means that the dealer has not put his organization in a proper basis whereby the car leaves his establishment in such shape that there is no come-back on the part of the customer. The latter, especially if a new driver, is apt to take the dealer's statement at its face value and make a pest of himself on every occasion when the car may be misfunctioning, or he just imagines something is wrong.

One of the surest ways to have a definite understanding with the owner, when he buys the car, is to have him sign a new car inspection sheet. A suggestion for such a sheet was published in the April 7th issue of MOTOR AGE, pages 22 and 23. A sheet of this kind, in the first place, makes sure that the car mechanically has been checked by the dealer. The sheet is signed by the manager and the mechanic who makes the inspection. If there are any items on the car which are questioned at the time, proper notation is made of this and the owner knows about it when the inspection report is presented to him for his signature.

For example, a car may come through from the factory with noisy timing gears and the car is turned over to the customer in the hopes that the gears will wear in properly after a few weeks' use. However, should the gears still remain noisy after the 30-day free service period, the customer would be justified in having a new set of gears put in, free of

When the Customer Talks Free Service Think of This

Free Service Chart

THE following service operations on passenger cars are those which the average dealer might classify under the general head of Free Service. This service should be rendered for a period of 30 days only, after which the customer must pay for every service operation, excepting in special cases wherein the history card or the new car inspection sheet reveals a fault which was not overcome during the 30-day period of free service and inspection. This is explained more fully in the text.

1—Adjust carbureter mixture.
2—Adjust ignition points.
3—Adjust valves tappets.
4—Adjust clutch.
5—Adjust tension of fan belt.
6—Adjust ring gear and pinion, if necessary.
7—Adjust charging rate of generator.
8—Adjust brakes.
9—Test wheel alignment.
10—Tighten body and chassis bolts.
11—Replace broken or defective parts excepting those broken through accident, collision or owner's carelessness.
12—Tune engine.

On this chart you will find listed some of the more frequent service operations necessary on a new car and for which the owner should not be charged

Let the Customer Know What He Must Pay for

Chargeable Service Chart

THIS chart lists some of the major service operations for which the customer should pay. In some instances dealers are doing many of these operations without cost to the customer, a procedure fundamentally wrong. It will be noted that the operations listed herewith are mainly those in which no actual repairing is done, the operations being confined chiefly to the quick service floor and not the repair shop itself.

1—Changing oil in crankcase.
2—Change lubricant in gearcase.
3—Change lubricant in differential housing and universal joints.
4—Oil and grease chassis.
5—Straighten bent or broken fenders, body parts, etc., incurred in collision, abuse, etc.
6—Installing accessories such as spotlights, instrument board clocks, cut-outs, ammeters, etc.
7—Painting owner's monogram on body.
8—Wash, clean and polish car.

Here are listed more of the important service operations on a new car for which the owner should pay. There is no reason why the dealer should make the customer a present of installing a spotlight or cut-out

charge, by the dealer in view of the fact that the inspection report shows the gears were faulty when the car came from the factory.

Investigations extending over considerable territory seem to indicate that the most satisfactory way of handling free service is on a 30-day basis. It is, of course, understood that the dealer will take care of the customer on the usual 90-day guarantee proposition affecting broken parts, etc. Most of the dealers using the 30-day period for free service handle it about in this manner. For example, they realize that the modern automobile is a complicated piece of machinery and that factory inspections are not always what they might be. Consequently, the car must be given a chance to wear in and usually this can be accomplished within the 90-day period. In other words, things which are likely to happen such as fender bolts working loose, clutch adjustment, valve tappet adjustment, etc., can be looked after and checked up properly in this length of time.

The major service operations which might come under the general head of Free Service are shown in one of the accompanying charts. This chart can be amplified by the dealer to suit his particular needs. In general, however, it will apply to nearly every service station, large or small. In connection with the 30-day free inspection period it might be well to instruct the customer to run his car about three weeks or so before he comes back to the service station for adjustments. This will prevent congestion and the customer and dealer will profit because all of the work can be done on the car at one time. If this is not done, some customers who will take all the service they can get will impose on the 30-day free period.

When it comes to charging for service rendered to the new car owner, the following applies. There is no reason why the dealer's service organization should not be paid for changing the oil in the crankcase of the customer's car. The same applies to changing the lubricants in the gearcase, differential and universal joints. Also, when a customer who has had his car several days comes in with a smashed fender, why should the dealer replace this fender with a new one and perform the work free of charge? The dealer is no more justified in doing this than a tailor would be in sewing up the pocket on a man's new coat when a man tried to put in a package four times too big for the pocket.

Another point: Too often a dealer will sell a man an accessory like a spotlight or a clock and suggest to the customer that he, the dealer, gladly will install it for him. What the dealer should do is this; he should say to the customer, "The spotlight will cost you $7.50 installed." This means that the dealer has figured on something like $1.50 for the installation so that he can tell the customer the price of the spotlight alone is $6.

Nine times out of ten the customer will want the dealer to make the installation, but under no circumstances is the dealer justified in selling the spotlight to the man for $6 and then offering to put it in place on the car free of charge. The same holds true with clocks, windshield wings, ammeters, monograms, etc.

This brings us to another important factor in free service and that is, the relationship or the friendship usually existing between a dealer, living in a small town, and his customer. The dealer in the small town is the one who is eminently in more danger than the large town dealer on the free service proposition because, knowing everybody by their first name, he is too apt to offer the service work free of charge. Even the small town dealer, we believe, can profit by utilizing a new car inspection sheet and having a definite understanding with the customer as to just what the latter must pay for.

HOW ONE DEALER BUILDS GOOD WILL

Like everything else there are exceptions to this rule of free service. We recall one case wherein a dealer builds up good will in his territory by going over all his customers' cars which chance to be in his shop with body polish before they are turned over to the customer. This cleaning of the body is not, in a sense, authorized by a car owner nor is record made of it on the work sheet of the shop.

It simply is a little extra measure of service and probably would be classed as free service by a good many, but the dealer states that he has profited immeasurably by it because of the psychological effect produced on a customer when the latter comes into the service station and sees the car appearing much neater than when it went into the shop.

Of course, one always will find car owners who demand more than their share of free service. Recently, a service manager told us of a case wherein the customer thought he ought to have a new clutch throw-out bearing put in his car free of charge because he had driven the car only three weeks and the bearing was ruined. When this owner received the car, he was instructed, particularly, to keep this bearing greased because it was made plain to him that the car left the service station mechanically all right and that it was up to him to keep the grease and oil cups filled. This customer neglected to watch the oiling and greasing of his car and then expected the service station to make good on the parts ruined by his own carelessness.

This is a typical case of where free service should not be rendered. Of course, in extreme cases where the customer is very irate and the outlook for a settlement is bad, the dealer will be better off if he satisfies the customer's wishes and does the work for nothing. One customer on the outside knocking a dealer's service can do more harm than ten customers who are for him.

Personal Contact and
A Well Equipped Electrical Service Station

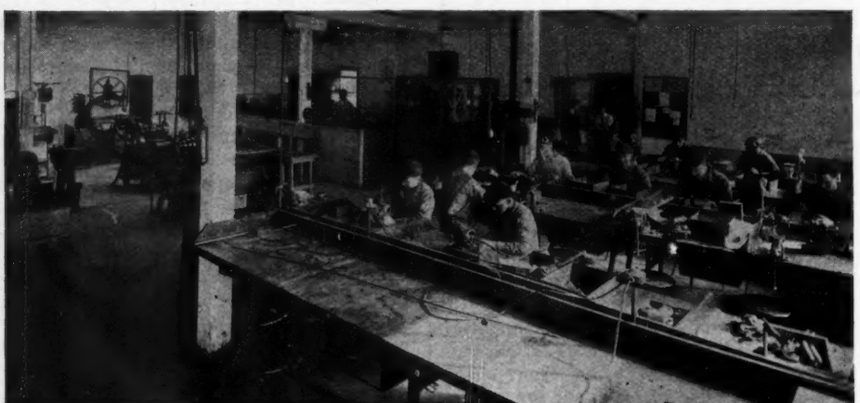
That Is the Combination Which Has Built Up the Arthur Jones Electrical Business—Read How No Customer Is Allowed to Leave Dissatisfied

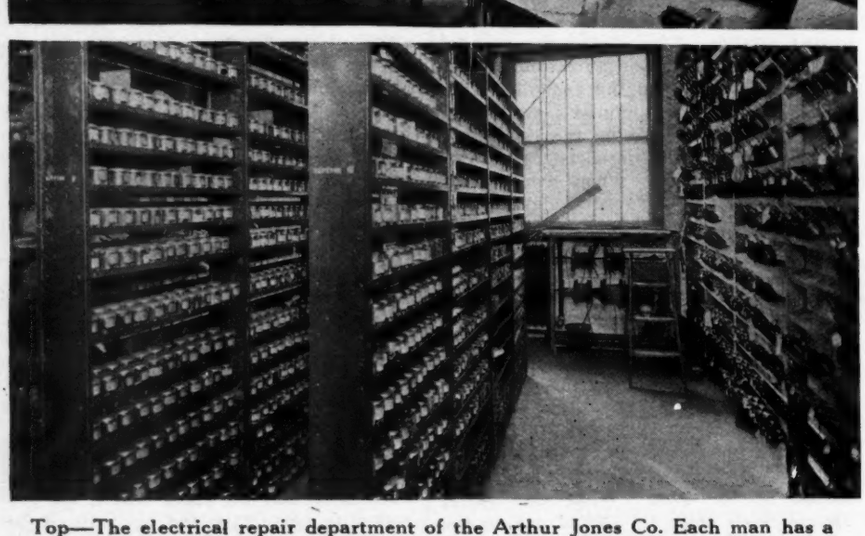
"IF our service pleases you tell others, if not, tell Jones." Thus is the car owner greeted by the wording of a sign when he drives into the service station of the Arthur Jones Electric Co. The "tell Jones" part of the sign means just what it says too. It doesn't mean that anyone of Mr. Jone's assistants has to stand the brunt of the customer's complaint. It is the old idea of acknowledging the righteousness of the customer's viewpoint, the underlying principle for the creation of satisfaction between server and served.

The Arthur Jones Electric Co. is an institution that does only electrical work. The business is wholesale and retail both in its merchandising and service. Dealers in and around Chicago who when anything seriously wrong with the electrical system of a car is found which is too complicated for their own force to handle, send the parts to Arthur Jones and he fixes them.

One of the most elaborate stock of electrical parts in the country is kept on hand by this concern, and a very good feature of the stock keeping methods is the perpetual inventory system which keeps a daily record on the whole parts stock. By the use of the perpetual inventory system the company knows at all times just how many parts of each kind are on hand. Then since the date of sale and date of delivery of ordered parts is kept on these tickets it is possible to tell the rate of sale for each part. Thus it is possible for the company to keep a three month's inventory on hand.

Electrical Men Should Study This Arrangement





Top—The electrical repair department of the Arthur Jones Co. Each man has a compartment of the bench assigned to him. This compartment is fitted with electrical testing devices. The man working on the part, perhaps it may be a generator, keeps the various parts in the steel box. All records pertaining to the work are kept here with the work. Below—Section of the stockroom showing the orderly arrangement of armatures and small parts. The small parts are kept in glass jars. This keep them free from dust

Formerly the Arthur Jones Electric Co. occupied a building that, we might say grew with the business. As the name and reputation of the organization spread it became necessary to acquire more and more operating space. Finally the available space on the old site became so limited that a new building was needed, and it was built. The new building was planned with incorporations of every known convenience for the rendering of electrical service. Every experience in the old building that pointed out the necessity of something that would better the service was incorporated in the new building and as a result this new building measuring 125 ft. sq. has been called "The most complete service station in America." Not having seen each and every electrical service station in the country we are not qualified to pass this characterization on but we will say that the place ranks with the best.

FOUNDED ON SERVICE

In the first place the institution is founded on service, service which stays put. We might illustrate by citing the particulars of an occurrence happening while the writer was in the building.

A party called for a certain generator that was being repaired. The generator was delivered to the counter with the bill attached amounting to something like twenty dollars. This bill was the source of the trouble. It developed that the generator had been in the shop before for repairs at which time the bill had been for a larger amount. That bill had been cheerfully paid. The generator after coming from the service station for the first time was applied to the car and for three days it operated perfectly. Then one night something went wrong and the generator heated up.

It became so hot that the insulation burned. These things were all explained to one of the men. (Mr. Jones was ill this day and consequently could not attend to the affair himself, otherwise he

undoubtedly would have.) The situation was simply this, that if the party had been asked to pay for the repair he would have left the place in a rage and the name of Arthur Jones would have been ridden to death to every friend. These in turn would spread the information around that Arthur Jones was not the right party to take the machinery to, and so by word of mouth a good deal of pernicious publicity would have been spread around. The man in charge appreciating all this, simply said to the customer that their highest ambition was to have him satisfied and told him that the bill was cancelled. The customer had not expected all of this but he was mighty satisfied when he learned of it. From now on he undoubtedly will be a strong booster.

That is the way the whole organization functions. The aim of every man is to turn out his work so that the customer will not have a chance for complaint.

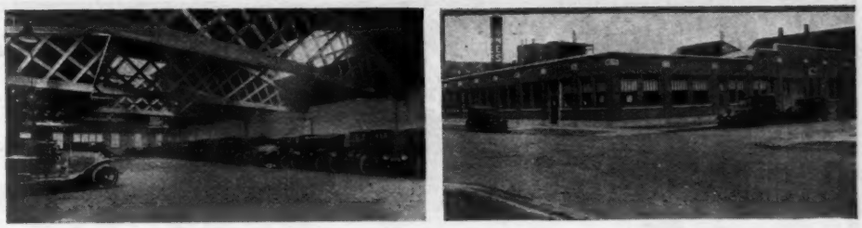
PUTTING IN SIX EXTRA SKYLIGHTS

As regards the building itself we show several views which we think tell a whole volume themselves. We call the attention of the reader to the picture illustrating the service room. This picture was taken without the aid of artificial light. The building was laid out by the architect for a good deal of light, but Mr. Jones decided that the architect had never had to do much repairing on his own motor car, so accordingly he had six more skylights added to the roof. The result is that there is so much daylight in the place that artificial light is never needed except at night and on the most cloudy days.

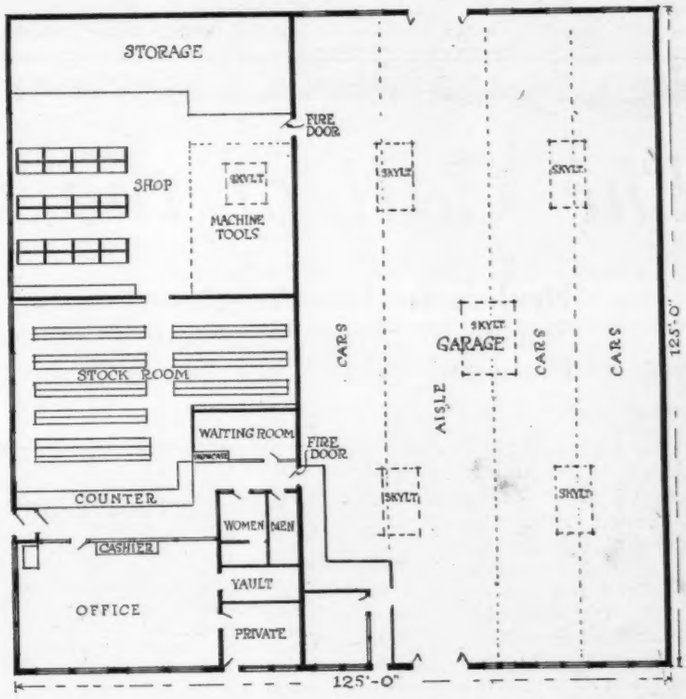
The layout of the building shows that every department is accessible one from the other, without a great deal of round about traveling. It is possible for the men in the shop to reach the machine room, the stockroom or the electrical repair room and for that matter the office too, without going from one to the other. The customers also find it convenient to walk from the service floor to the waiting room that is provided for them.

A new phase of the service system as worked in this establishment is the Arthur Jones authorized dealer organization that is being built up in the surrounding territory. The Jones company maintains a very large stock of parts, suitable for out of date systems as well as current model material. This stock is very complete and is much larger than any dealer in a small town could carry. Consequently these dealers find it to their advantage to act as a representative for the Jones company, and in effect, therefore, their service then becomes Jones service.

A complete parts stock for the following makes of apparatus is kept on hand at all times: Adlake, Newbold, Bijur, Connecticut Dyneto, Heinze-Springfield, Jessco, K-W Ignition, Philadelphia Battery, Van-Sicklen Speedometers, Waltham clocks, Waltham speedometers, Westinghouse, Delco, Klaxon, Remy, Atwater Kent, Bendix drive Norma Ball bearing, Packard cable Bethlehem spark plugs, and Perfection motor car heaters.



The inside and the outside of the Arthur Jones Electrical Co.'s new building. Note what a well laid out skylight system will do for a building in the way of lighting. It is said of this place that artificial light is not needed except at night and on the very darkest and cloudy days



A Plan Based on Ten Years' Study of Electrical Service

It is well worth while to study this floor plan. Note that one may reach any department without walking through every other department. Including the cars that come into this establishment every day with the generators and other electrical parts that are shipped by parcel post and other means, the total mounts up to about two hundred separate jobs every day

One may ask where the psychology of the thing comes in, and the answer is in the participation of the car owner's wants and needs. The complete stock parts for one thing makes it improbable that a call will come for anything that is not on hand. The perpetual inventory system makes sure that no parts will ever run out through lack of information about the quantity on hand. The cleanliness of the place invites the owner. The electric door openers are operated from multiple buttons over the whole place. About these electric buttons for the opening of the doors we might say a word or two. On the outside of the entrance door is painted in large black letters the words "Sound Horn." As soon as a man within hears the horn blowing he reaches for the nearest button and the door opens. Mr. Jones has a button located near his desk which will also operate these doors and should it happen that all of the men in the shop are engaged and find it impossible to open the door when the car owner blows his horn several times, Mr. Jones immediately presses his button.

Identify Yourself with Civic Bodies

Every live wire dealer should be represented in the local Chamber of Commerce, Ad Club, Kiwanis, Rotary or Optimist Clubs, if possible, and should be identified with every progressive, forward looking movement in the city. The dealers that do all this come in contact with the leading business men of the city, and consequently are in a splendid position to do business.

The Call of the Open Road

Dealers in Los Angeles Availed Themselves of the Season to Bring Nature to Their Salesroom as Selling Plan and What They Have Done Can Be Duplicated

LOS ANGELES, April 22—The motor car dealers of Los Angeles recently participated in an enterprise that was an innovation and one that proved highly successful in helping to stimulate business. It was known as "The Call of the Open Road—Are you Prepared?" week. The idea was to make such a strong appeal in behalf of the outdoor to the public that it could not go unheeded and then prove that the most vital necessity in the way of preparation was through the purchase of a motor car. There are many interesting and attractive places in southern California, of which Los Angeles is the metropolis, but as in almost all other sections of the country nobody knows about all of these.

The dealers decided it behooved them to tell the public where to go, how to get there and the proper means was the automobile. A meeting was held and it was agreed to go into the enterprise with customary unanimity and endeavor. It had been several months since the automobile show and the public was losing sight of the attractiveness of owning a new motor car. Trade doesn't come to those who wait but to those who go after it and the Los Angeles dealers determined to go after it. They proposed to go after it in a way different from all previous undertakings.

In poster form, "The Call of the Open Road—Are You Ready?" week was heralded on about 300 billboards and on thousands of window cards. The Saturday and Sunday preceding the week, the city newspapers devoted special sections to the event. The press of the smaller cities and towns also helped out. The newspapers put forth an extra effort. One of them printed the cover page of its section in four colors. The star artists of the staff were assigned to drawing special illustrations. The individual dealers made their advertising appropriate, the sole purpose being to attract interest to the great outdoors and the motor car. The dealers' advertising men met with the automobile editors and programmed all of the publicity. The dealers were assigned stories and pictures. It remained with them to send out a car and get photographs of the various places of unusual appeal to motorists. The territory from Yosemite Valley to Painted Desert was covered by the various subjects. There was no duplication among the newspapers so that half a hundred or more points were described and illustrated. There was no reference made to the automobile except incidentally.

The opening day of the "week," an attractive parade was held in the principal streets of the downtown district. Each dealer was permitted to enter two models of the make of car he represented. Each car had to be occupied. A number of floats typifying neighboring resorts added to the effectiveness of the parade. A group of girls in bathing costumes riding in a car designed to imitate a motor boat was a big hit. Another was a float depicting the Bear Valley resorts which was featured by a live bear.

The importance of the open road to commercial vehicles was appreciated and motor trucks took part in the parade. One truck carried a chassis turned over on its side with all working parts exposed. Bands were interspersed in the line and there was plenty of music. The floats covered the business district daily but the big parade was a one-time event. Some of the downtown merchants became enthused over the proposition and took advantage of the opportunity to cooperate by using motor cars in their window displays.

The biggest spread of all was made by the dealers at their respective places of business. Storerooms and windows were decorated as never before. And when it comes to making an open road display in an automobile store, the Los Angeles dealers showed it can be done with wonderful effects. In some of the displays were living models. In one was a pool with 40 live mountain trout. Others reproduced the beach with real sand and girls in bathing suits lounged

Concluded on page 53

It Can Be Done Again

DEALERS in any city of the country, small or large, can follow the plan adopted by those in Los Angeles in staging a "Call of the Open Road" week and if they go about it in as big league style as was done in that city they are reasonably assured of similar results. Any dealer can get the same decorations and lay out his salesroom in the same novel way. Such a means of bringing home to the prospect the message of the open road and the message of the motor car will bring greater enthusiasm to the salesmen as well as to the public and will inject a tonic the effectiveness of which will be proved in stimulated sales as was the case in the California city.

Salesroom Settings That Made a Strong Appeal

Below are shown some realistic outdoor scenes that Los Angeles dealers displayed during "Call of the Road Week"

Upper left—Forget the tiled floor and can you imagine a better mountain cabin than this? Lower left—Charming living models helped add to the enticement of this scene—a pool in the background contained forty live mountain trout. Upper right—This display included everything from the owl in the tree to the ham and eggs in the skillet. Middle right—Senor Romeo and his band never knew the alluring outdoors in better style than these gypsies in the Packard salesroom. Lower right—A. E. Evans & Co., Faige distributors, staged this on the washrack in the service department. The young lady in the background is getting a drink at the "spring." The public didn't understand where the water went but the washrack was the secret

An Analysis of the Farmer's Truck Needs Based on Actual Experience

In Four Parts—Part III—Save This Valuable Data. *Dealers will find profitable use for this information from 753 reports from farmer truck owners, compiled by H. R. Tolley, scientific assistant, and L. M. Church, assistant in farm accounting of the United States Department of Agriculture.*

CHANGE OF MARKET (CONTINUED)

Of 26 men who formerly used markets 10 to 14 miles distant—
- 1 now uses market 5 to 9 miles distant.
- 4 now use markets 10 to 14 miles distant.
- 7 now use markets 15 to 19 miles distant.
- 2 now use markets 20 to 24 miles distant.
- 2 now use markets 25 to 29 miles distant.
- 10 now use markets 30 or more miles distant.

Of 8 men who formerly used markets 15 to 19 miles distant—
- 1 now uses market 5 to 9 miles distant.
- 2 now use markets 15 to 19 miles distant.
- 1 now uses market 20 to 24 miles distant.
- 2 now use markets 25 to 29 miles distant.
- 2 now use markets 30 or more miles distant.

Of 5 men who formerly used markets 20 or more miles distant—
- 1 now uses market 1 to 4 miles distant.
- 1 now uses market 20 to 24 miles distant.
- 3 now use markets 30 or more miles distant.

Before purchasing their trucks the operators of 75 per cent of these farms used markets less than 10 miles from their farms, but now over 80 per cent of them are using markets 10 miles or more from their farms. The average distance to the old market was 7 miles, and the average distance to the new market is 20 miles.

Seventy-one of these 156 men now use markets which are 20 miles or more from the farm. Of the entire 704 men who reported concerning their markets only 164 are now using markets which are 20 or more miles from the farm. Thus over 40 per cent of the men who now use markets which are such a great distance from their farms have changed markets since purchasing their trucks.

ANNUAL USE OF TRUCKS

The number of miles per year which a motor truck travels has a direct bearing upon the cost per mile run or per ton hauled. Depreciation, interest, and repair charges appear all more or less independent of the number of miles which the truck travels per year, and the greater the number of miles traveled per year, or the greater the amount of material hauled, the less will be the charge per mile or per ton hauled for these items.

Following is a summary of the estimates of 553 men as to the number of miles per year which their trucks travel:
- 58, or 10 per cent, estimated the annual mileage at 1,250 or less.
- 118, or 22 per cent, estimated the annual mileage at 1,251 to 2,250.
- 115, or 21 per cent, estimated the annual mileage at 2,251 to 3,250.
- 92, or 17 per cent, estimated the annual mileage at 3,251 to 4,250.
- 66, or 12 per cent, estimated the annual mileage at 4,251 to 5,250.
- 34, or 6 per cent, estimated the annual mileage at 5,251 to 6,250.
- 19, or 3 per cent, estimated the annual mileage at 6,251 to 7,250.
- 19, or 3 per cent, estimated the annual mileage at 7,251 to 8,250.
- 7, or 1 per cent, estimated the annual mileage at 8,251 to 9,250.
- 14, or 3 per cent, estimated the annual mileage at 9,251 to 10,250.
- 11, or 2 per cent, estimated the annual mileage at 10,251 or more.

The average of the estimates of these 553 men is 3,820 miles, but 53 per cent of the estimates were 3,250 miles or less.

The amount of material hauled from and to the farm, which depends on the type of farming and the size of the farm; the size of load, which depends on the size of the truck; and the length of haul, all have an influence on the distance per year which a truck travels, but for the farms under consideration these factors are all corelated in such a way that no one of them exerts a predominating influence. For instance, the average of the estimates of the number of miles per year traveled by the trucks on the farms of different types is as follows:

	Miles.
108 truck farms	3,800
93 dairy farms	3,960
89 fruit farms	3,980
36 crop farms	3,240
227 general farms	3,800

Similarly, the size of the truck and the distance from the farm to market show very little relation to the number of miles traveled per year. The average of the estimates of—
- 113 men who own ½-ton trucks is 3,790 miles per year.
- 80 men who own ¾-ton trucks is 4,370 miles per year.
- 232 men who own 1-ton trucks is 3,660 miles per year.
- 52 men who own 1¼- and 1½-ton trucks is 3,100 miles per year.
- 60 men who own 2-ton trucks is 4,070 miles per year.
- 16 men who own 2½-ton and larger trucks is 4,980 miles per year.

These farmers were also asked for their estimate of the number of days per year on which they used their trucks—not the number of full days' work per year which the truck did, but simply the number of days on which some use was made of it. The average of the estimates of the number of days per year on which some use is made of the trucks on farms of different types is shown in Table XIII. The dairy farmers use their trucks on the most days and the crop farmers on the fewest. The estimates also showed that in general the smaller trucks were used on a somewhat greater number of days than were the larger ones.

TABLE XIII.—*Days per year on which trucks are used.*

Type of farming.	Number of estimates.	Days per year on which truck is used.
Truck	133	160
Dairy	109	244
Fruit	99	159
Crop	43	127
General	255	162
All	639	173

LIFE AND DEPRECIATION OF TRUCKS

The average first cost, average life, and the average depreciation per year and per mile traveled for trucks of ½ to 2 tons in size are shown in Table XIV. There were so few reports on trucks over 2 tons in size that no figures for them have been included.

TABLE XIV.—*First cost, life, and depreciation charges for trucks of different sizes.*

(Italic figures in parenthesis indicate number of reports for respective items.)

Size of truck.	½-ton.	¾-ton.	1-ton.	1½- and 1½-ton.	2-ton.
First cost	$574 (*149*)	$1,269 (*94*)	$900 (*342*)	$1,731 (*67*)	$2,366 (*9*)
Extra equipment	26 (*116*)	37 (*66*)	59 (*289*)	111 (*50*)	99 (*58*)
Total cost	600	1,306	959	1,842	2,465
Present age (years)	2.7 (*150*)	2.3 (*95*)	1.6 (*344*)	2.1 (*67*)	2.5 (*79*)
Remaining life (yrs.)	3.9 (*94*)	4.8 (*56*)	4.7 (*196*)	5.1 (*40*)	5.4 (*48*)
Total life (years)	6.6	7.1	6.3	7.2	7.9
Annual depreciation	$91	$184	$152	$256	$312
Miles traveled per yr.	3,700 (*113*)	4,370 (*80*)	3,660 (*232*)	3,100 (*52*)	4,070 (*60*)
Depreciation per mile of travel	$0.024	$0.042	$0.041	$0.083	$0.077

The quoted price of the truck often does not include some equipment which it is necessary or desirable to have, and each man was asked to report not only the first cost of his truck, but also the cost of any extra equipment he had purchased for it. It was found that nearly 75 per cent of the men had bought some equipment which was not included in the quoted price. This extra equipment varied from minor attachments costing only $2 or $3 to bodies and cabs costing as much as $200 or $300. As shown in the table, the amount spent for this extra equipment has been added to the reported first cost to obtain the total cost.

In all, 7 men reported that they owned trailers for use with their motor trucks. However, the cost of these trailers was not included in the total cost of the trucks.

The total life of the trucks was figured by adding the present age (that is, the average number of years which the trucks had been owned) to the average of the estimates of the remaining number of years for which the trucks will give satisfactory service. The remaining life of the truck depends not only upon its present condition, but also upon the probable work it will do in the future, and the owner's idea as to when it will be cheaper to discard it and purchase a new one than to spend more time and money on it for repairs. There is quite a wide variation in the individual estimates on this item, but the average life as obtained in this manner gives the best available basis for figuring depreciation costs. The average life of all trucks as figured by this method was 6.7 years.

The annual depreciation was figured by dividing the first cost by the life in years, the depreciation per mile of travel by dividing the annual depreciation by the average number of miles traveled per year. A comparison of these figures with those for the cost of fuel and oil in Table XVI and for tires in Table XVII shows that for each size the depreciation charge is greater than the cost of fuel and oil, and for the larger sizes it is greater than the combined costs of fuel, oil, and tires.

REPAIRS

Each truck owner was asked to report the amount he had spent for repairs since the purchase of his truck. A summary of the replies for trucks of different sizes is given in Table XV.

TABLE XV.—*Average repair costs of trucks of different sizes and ages.*

Present age (months owned).	Size of truck.				
	½-ton.	¾-ton	1-ton.	1½- and 1½-ton.	2-ton
	Average total expense for repairs.				
12 and less	$9	$20	$14	$2	$19
13 to 24	36	42	49	28	112
25 to 36	52	116	65	89	143
37 and over	186	191	155	127	444

In all, 40 per cent of the men who had not owned their trucks 12 months had spent nothing on them for repairs. However, very few of those who had owned their trucks for more than 12 months had been free from expense for repairs. The amounts which the owners of the trucks of different sizes had spent are as follows:

Half-ton trucks:

Of 20 men who had used their trucks 12 months or less—
- 7 had spent nothing for repairs.
- 13 had spent from $1 to $87.

Of 30 men who had used their trucks 13 to 24 months—
- 28 had spent from $1 to $87.
- 2 had spent from $88 to $187.

Of 41 men who had used their trucks 25 to 36 months—
- 1 had spent nothing for repairs.
- 30 had spent from $1 to $87.
- 9 had spent from $88 to $187.
- 1 had spent from $188 to $287.

Of 36 men who had used their trucks 37 months or more—
- 1 had spent nothing for repairs.
- 21 had spent from $1 to $87.
- 4 had spent from $88 to $187.
- 3 had spent from $188 to $287.
- 2 had spent from $288 to $387.
- 5 had spent $388 or more.

Three-fourths-ton trucks:

Of 18 men who had used their trucks 12 months or less—
- 7 had spent nothing for repairs.
- 11 had spent from $1 to $87.

Of 27 men who had used their trucks 13 to 24 months—
- 4 had spent nothing for repairs.
- 19 had spent from $1 to $87.
- 3 had spent from $88 to $187.
- 1 had spent from $288 to $387.

Of 25 men who had used their trucks 25 to 36 months—
- 3 had spent nothing for repairs.
- 12 had spent from $1 to $87.
- 4 had spent from $88 to $187.
- 3 had spent from $188 to $287.
- 2 had spent from $288 to $387.
- 1 had spent $388 or more.

Of 18 men who had used their trucks 37 months or more—
- 1 had spent nothing for repairs.
- 7 had spent from $1 to $87.
- 2 had spent from $88 to $187.
- 4 had spent from $188 to $287.
- 2 had spent from $288 to $387.
- 2 had spent $388 or more.

One-ton trucks:

Of 127 men who had used their trucks 12 months or less—
- 50 had spent nothing for repairs.
- 73 had spent from $1 to $87.
- 4 had spent from $88 to $187.

Of 134 men who had used their trucks 13 to 24 months—
- 15 had spent nothing for repairs.
- 96 had spent from $1 to $87.
- 13 had spent from $88 to $187.
- 7 had spent from $188 to $287.
- 3 had spent from $288 to $387.

Of 39 men who had used their trucks 25 to 36 months—
- 3 had spent nothing for repairs.
- 26 had spent from $1 to $87.
- 7 had spent from $88 to $187.
- 2 had spent from $188 to $287.
- 1 had spent $388 or more.

Of 25 men who had used their trucks 37 months or more—
- 12 had spent from $1 to $87.
- 6 had spent from $88 to $187.
- 1 had spent from $188 to $287.
- 4 had spent from $288 to $387.
- 2 had spent $388 or more.

Trucks of 1¼ to 1½ tons:

Of 10 men who had used their trucks 12 months or less—
- 8 had spent nothing for repairs.
- 2 had spent from $1 to $87.

Of 28 men who had used their trucks 13 to 24 months—
- 7 had spent nothing for repairs.

Trucks of 1¼ to 1½ tons—Continued.
18 had spent from $1 to $88.
3 had spent from $88 to $187.

Of 12 men who had used their trucks 25 to 36 months—
2 had spent nothing for repairs.
4 had spent from $1 to $87.
4 had spent from $88 to $187.
2 had spent from $188 to $287.

Of 11 men who had used their trucks 37 months or more—
5 had spent from $1 to $87.
4 had spent from $88 to $187.
1 had spent from $188 to $287.
1 had spent $388 or more.

Two-ton trucks:

Of 10 men who had used their trucks 12 months or less—
4 had spent nothing for repairs.
5 had spent from $1 to $87.
1 had spent from $88 to $187.

Of 23 men who had used their trucks 13 to 24 months—
3 had spent nothing for repairs.
13 had spent from $1 to $87.
2 had spent from $88 to $187.
2 had spent from $188 to $287.
3 had spent $388 or more.

Of 27 men who had used their trucks 25 to 36 months—
3 had spent nothing for repairs.
12 had spent from $1 to $87.
6 had spent from $88 to $187.
2 had spent from $188 to $287.
1 had spent from $288 to $387.
3 had spent $388 or more.

Of 11 men who had used their trucks 37 months or more—
3 had spent from $1 to $87.
1 had spent from $88 to $187.
7 had spent $388 or more.

The average age of the trucks which had been owned 37 months or more was not far from 4 years, and on this basis the average annual repair costs for the first 4 years of these trucks' lives were approximately $35 for the ½-ton trucks, $50 for the ¾-ton, $40 for the 1-ton, $35 for the 1¼-ton and 1½-ton, and $110 for the 2-ton. It is apparent that these figures are too low for the average annual repair cost for the entire life of the machines, but since none of the machines reported on were entirely worn out it is impossible to obtain accurate figures for this item. In the absence of accurate figures, allowances of $50 per year for the ½-ton trucks, $75 for the ¾-ton trucks, $75 for the 1-ton trucks, $100 for the 1¼-ton and 1½-ton trucks, and $150 for the 2-ton trucks, have been made as fair charges for the average annual repair costs in figuring the cost of operation in Table XX.

GASOLINE AND OIL

The average number of miles obtained per gallon of gasoline and per quart of cylinder oil by the men who use trucks of different sizes are shown in Table XVI. The average price which these men paid for gasoline at the time they made their reports (January and February, 1920), was 27 cents per gallon, and the average price of lubricating oil was 65 cents per gallon. The costs per mile traveled are computed from these figures. No attempt was made to learn the amount and value of the grease used, but in any case its value should be only a fraction of that of the lubricating oil.

TABLE XVI.—*Gasoline and oil requirements of trucks of different sizes.*

(Gasoline at 27 cents per gallon; lubricating oil at 65 cents per gallon.)

Size of truck.	Gasoline.			Oil.			Total cost per mile for gasoline and oil.
	Miles per gallon.	Number of reports.	Cost per mile	Miles per quart.	Number of reports.	Cost per mile.	
½-ton	14.8	138	$0.018	59	93	$0.003	$0.021
¾-ton	12.1	92	.022	58	71	.003	.025
1-ton	11.2	332	.024	48	281	.003	.027
1¼-and 1½-ton	9.5	64	.028	49	54	.003	.031
2-ton	8.0	75	.034	40	62	.004	.038

TIRES

Each man was asked to state what he paid for tires and the mileage obtained. The cost per mile for tires as shown in Table XVII is figured by simply dividing the average cost per tire by the average number of miles which the tire runs, and multiplying this result by four to obtain the cost for four tires. According to the estimates of 318 men, the pneumatic tires on these trucks run an average of 4,500 miles, and according to the estimates of 206 men the solid tires run an average of 8,200 miles. Such a large percentage of the ½-ton and ¾-ton trucks used are equipped with pneumatic tires that no figures for solid tire costs for these sizes are given, and such a large percentage of the trucks over 1 ton in size are equipped with solid tires that no figures for pneumatic tire costs for them are shown.

An allowance for the mileage obtained from the tires with which a machine is equipped when purchased must be made in order to determine the net tire cost to the user, as the cost of the first set of tires is included in the purchase price of the truck.

According to the estimates of these men the percentage of the total mileage of the trucks obtained from the tires with which they are equipped when purchased is as follows:

Pneumatic tires on the ½-ton trucks run 18 per cent of the total mileage.

Pneumatic tires on the ¾-ton trucks run 17 per cent of the total mileage.

Pneumatic tires on the 1-ton trucks run 19 per cent of the total mileage.

Solid tires on the 1-ton trucks run 36 per cent of the total mileage.

Solid tires on the 1¼- and 1½-ton trucks run 40 per cent of the total mileage.

Solid tires on the 2-ton trucks run 26 per cent of the total mileage.

The cost per mile as indicated by the cost of the tires and miles which they run has been reduced by these percentages in order to obtain the net cost per mile traveled. No attempt was made to obtain the cost of inner tubes for pneumatic tires or to obtain the cost of tire repairs separately from the entire repair costs of the trucks.

TABLE XVII.—*Tire costs.*

Size of truck.	Kind of tires.	Cost per mile.	Number of reports.	Allowance for tires on machine when bought.	Net cost per mile.
½-ton	Pneumatic	$0.020	113	$0.004	$0.016
¾-ton	do	.035	47	.006	.029
1-ton	do	.020	151	.004	.016
1-ton	Solid	.020	94	.007	.013
1¼- and 1½-ton	do	.029	20	.012	.017
2-ton	do	.034	25	.009	.025

KIND OF TIRES RECOMMENDED BY USERS

These truck owners were asked what kind of tires they consider the best for their conditions, regardless of the kind actually used. The kinds of tires which 637 men with trucks of all sizes are now using, together with the kinds they prefer, are as follows:

Of 231 men who use pneumatic tires—
230 prefer pneumatics.
1 prefers pneumatics in front and solids in rear.

Of 209 men who now use solid tires—
16 prefer pneumatics.
192 prefer solids.
1 prefers pneumatics in front and solids in rear.

Of 197 men who now use pneumatics in front and solids in rear—
75 prefer pneumatics.
67 prefer solids.
55 prefer pneumatics in front and solids in rear.

In all, 36 per cent now use pneumatics, 33 per cent use solids, and 31 per cent use pneumatics in front and solids in the rear, while 50 per cent prefer pneumatics, 41 per cent prefer solids, and only 9 per cent prefer pneumatics in front and solids in rear.

(*To be concluded next week*)

America's Ideal Road Determined

Sample Section Will Be Placed Where All Interested in Lasting Highways May Test and Copy It—Experts Say It Will Be the Finest Example of Road Building in the World

SOME TIME ago the Lincoln Highway Association appointed a committee to draw up the specifications of an "ideal section" of roadway and that committee has reached an agreement on all points and the final plans now are being prepared.

Briefly the ideal section is to be a relatively short section of highway, so located that it will readily be accessible from all parts of the country for the purpose of inspection and placed also where it will carry a representative and diversified traffic in the course of the coming year. When finished it is the expectation of the association that the section will be the finest example of main road building in America, if, indeed, not the world.

The association appealed to all America for its conception of a highway ideal, but particularly to those engaged in practical road building and those close to the problems which confront the road builder and road user. Then the American highway engineering profession was appealed to. The replies were classified and tabulated and finally, this winter, a committee was appointed to represent the various phases of interest in highway construction, design and use, and to finally draft the specifications and determine what constituted a reasonable standard of highway perfection.

After much discussion the committee unanimously voted to predicate the specifications for the ideal section upon an average traffic of 15,000 passenger cars, traveling at 35 m.p.h., and 5,000 motor trucks, traveling at 10 m.p.h. These arbitrary figures indicate that the technical committee believes that 20,000 mixed vehicles per 24-hour-day, represents the practical limits of traffic on one road. In other words, should a traffic heavier than that develop between two points, it is wise to construct another parallel road on a separate right-of-way for the additional travel, rather than to endeavor to concentrate it on the one road, through increasing the road's width or strength.

Having crystallized the problem and decided definitely for what conditions it was necessary and wise to provide, the committee agreed upon a minimum right-of-way of 100 ft. The majority of American roads have a 60-ft. right-of-way—far too narrow, according to the minimum standard set by these men. A resolution was passed at the final meeting providing that a sub-committee be appointed to carefully study the final design and determine if the right-of-way requirements had been adequately taken care of. One hundred and ten, or 112, or even 125-ft. of right-of-way, may ultimately be determined upon as necessary, but 100 ft. is the minimum.

Build Roads That Endure

THE ideal section will serve the purpose the Lincoln Highway conceived for it and the purpose the United States Rubber Co. had in mind in appropriating the funds necessary to construct it, if the American public will be enabled to gain from it a more adequate conception of the demands of modern traffic in the way of highway improvement and if highway builders having in their charge millions of dollars of public funds, can, through the inspiration of its example and an enlightened public sentiment, increase the adequacy of their specifications and provide more nearly what the future will demand.

The committee finally agreed on 40 ft. of concrete paving, with reinforcing steel embedded, 10-in. thick and laid in one continuous slab without central subdivision. There were members of the committee who originally felt that the ideal type of construction should segregate travel according to direction, by providing for two separate strips of concrete paving on either side of a central parkway—one-way traffic on each side. While the committee as a whole agreed that this form of construction made for safety and for greater speed and convenience, it felt this design lacked flexibility and did not make for the most economical and fullest use of the paving provided. Forty feet of paving width permits four lanes of travel, a lane for slow-moving trucks and a lane for rapidly moving passenger vehicles, in each direction.

SAFETY AND BEAUTY PROVIDED

In determining upon the kind and thickness of the paving and the use of reinforcing steel, the committee was providing for permanency and endeavoring insofar as possible, to cut down annual maintenance charges. In planning this thickness and design the committee did not assume much greater weight on four wheels than is allowed by the several states at the present time. Twenty-eight thousand pounds on four wheels was considered the practical road limit.

A forty foot paved road would be safe. It allows plenty of room between vehicles, even at peak hours of traffic congestion. But the committee decreed that the dangerous open ditch, at present found along the greater proportion of our country roads, should go. The ideal section will be drained by catch basins with submerged tile under the earth shoulders.

The other dangers of present roads result from three conditions: first, unnecessary and narrow radius curves, frequently insufficiently banked or superelevated; second, from darkness and glaring headlights, and third, from pedestrianism.

The committee provided that the ideal road should have no curves of less than 100 ft. radius, and that such curves as were necessary should be 'super elevated,' or banked to allow for a speed of 35 m.p.h. In other words, so built that you can round them at that speed with safety. It provided for the lighting of the route, which would permit of the use of dimmers in the open country, and it added a foot path for pedestrians.

The committee agreed upon the necessity of aesthetic considerations and, in allowing 25 ft. of right-of-way at the outer edge for development by a landscape architect, provided also in its recommendations for frequent park and camp sites, comfort stations, etc.

The safety and convenience of the traveling public was further considered in the provision for protection of all embankments with guard rails and warning signs and the elimination of all railroad crossings at grade, and the removal of all obstructions insofar as possible, for 500 ft. each way from intersections, thus providing a clear view of the coming travel on cross roads.

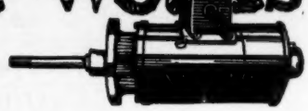
The committee pronounced itself against advertising signs along highways and recommended that ultimately all distance markers, etc., be placed or authorized only by proper state and federal authorities and be standardized in character and distances. Wires will run underground in conduits.

The general specifications will be fitted to the specific location determined upon, and the association hopes it will not be long before the American public and those interested in highway construction, can drive over and inspect, photograph and study, an actual section of this ideal road, built with the utmost care, under faithful supervision and with the interest and assistance of the Federal government and the state and county in which it is located.

How the Electric System Works

Article III

By A. H. PACKER
Instructor, Ambu Engineering Institute.



A Short Series of Articles Wherein Is Given the Fundamentals Underlying the Operation of the Modern Electric System as Applied to Automotive Apparatus

Answers to Problems in Last Week's Article

PROBLEM NO 1

Total resistance is 8 ohms plus 4 ohms or 12 ohms. The current is then 6 volts divided by 12 ohms or .5 amp.

The voltage drop across the lamp is then .5 amp. times 8 ohms or 4 volts.

PROBLEM NO 2

The current in each branch of the circuit will be 6 volts divided by 8 ohms or .75 amp., or the total current will be twice that or 1.5 amp. flowing from the battery.

The total parallel resistance can be found by dividing 6 volts by 1.5 amp., the answer being 4 ohms, or from the rule for parallel circuits we know that with two 8 ohm resistances in parallel the total is half of one of them or 4 ohms.

PROBLEM NO 3

With two 2 ohms resistances in parallel the effective resistance is 1 ohm, which is in series with the 5 ohm dimming coil. Adding this resistance of 5 ohms to the 1 ohms, lamp resistance we have a total of 6 ohms, which with a 6 volt battery allows 1 amp. to flow.

With 1 amp. flowing in the 1 ohm lamp circuit we have the product of 1 volt as the lamp voltage. At this voltage the lamps would not be bright enough for even the dim position showing that 5 ohms is too much for the dimmer resistance.

CRASH! A flying milk bottle breathed its last against the brick wall, as the side door of the shop flew open. Out of the door shot a red headed lad, and close behind came Bill. Down the street they went, Bill's arms waving wildly, his face red with exertion, his lips hurling a verbal barrage after the fleeing red head. Soon youth and terror, began to have the edge on age and anger and the red head gradually increased his lead. Bill stopped, shook his fist at his department helper, and started wearily back toward the shop, where I was waiting, an interested spectator.

"Hang it all," said Bill, as he calmed down a bit and started to explain how I happened to be a privileged spectator at this impromptu Marathon. "That kid told me he was the one and only electrical wizard, and I fell for it. In fact he got by with a job or two, by luck I suppose, and then he asked for my new meter to test a battery." "I let him have it and what do you s'pose he does?" "Uses the ammeter side instead of the voltmeter side, and burned out the whole works, then said he thought it didn't matter which side you used, 'cause they look about alike." "When he said that, I started to see things, grabbed a milk bottle, and, well, you saw the rest," and Bill pointed wearily to the wrecked meter, a thin film of smoke still showing under the glass.

I knew exactly how Bill felt, but I also could appreciate his helper's feelings, for he had been trying to do work for which he was not properly prepared. When in school he doubtless felt it a waste of time to monkey with magnets, iron filings, wires and things, so that when he came to use Bill's meter, he made a mistake natural enough, when the principle of operation was not understood.

It has often been said that the longest way round is the shortest way home; and in learning the electrical game this is certainly true, for to understand the action of electrical meters, we can gain time by starting with simple conditions of magnetism, and its relation to electricity.

We are all familiar with the ordinary horseshoe magnet, which will pick up pieces of iron or steel, and we also know that it starts to pull on such pieces, even when they are some little distance away. Another action of magnetism that we all know, is the tendency of a magnetized piece of steel such as a compass needle to turn so that it lays in a north and south position.

Now the end of the magnet that tries to point to the north we call a north seeking pole or simply a north pole, and the other is called the south pole. Then in experimenting further we find that like poles such as two north or two south poles repel each other while unlike poles attract.

To explain the action of magnetism, we assume that the molecules, or small particles of which the iron is composed, are like small magnets, but that in ordinary iron they point in no particular direction. When the iron is magnetized, however, we assume that these molecules line up so as to point in one direction, and in Fig. 1 these molecules in the magnetized piece are indicated by diamond shaped figures, the blackened end of each representing the north end, and as they all point toward one end of the horseshoe, it gives that end a north pole effect.

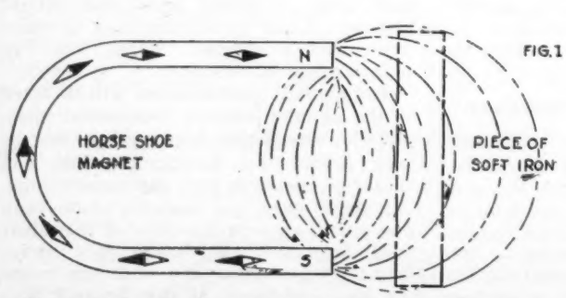


Fig. 1—How the lines of force from a horseshoe magnet emanate from the pole tips

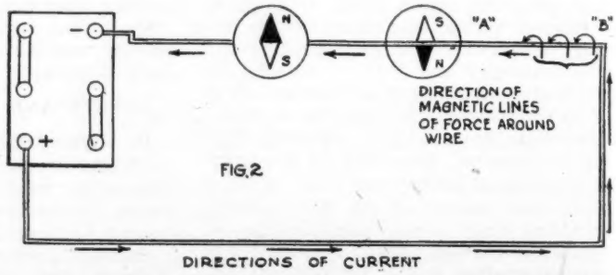


Fig. 2—Showing how a compass will register when placed above and below a conductor carrying direct current

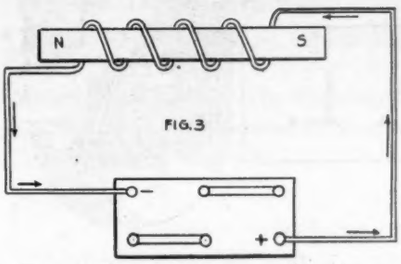


Fig. 3—The current traveling in a conductor and wound around an iron core will create north and south poles in the relation as indicated

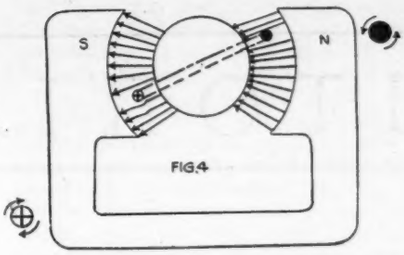


Fig. 4—This shows the direction of travel of the produced current in a conductor revolving in a magnetic field

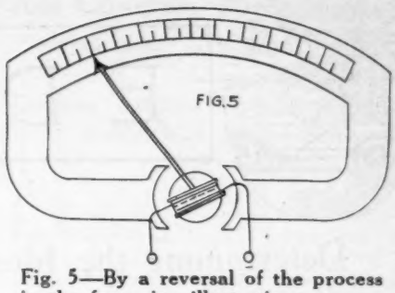


Fig. 5—By a reversal of the process in the foregoing illustrations an ammeter or voltmeter is made to indicate

To further explain magnetic effect, we think of the attraction and repulsion as produced by lines of force, which flow in a circuit from N to S out in the air, and from S to N inside of the magnet. We also consider that these lines are elastic, somewhat in the nature of rubber bands, and that they are always trying to find the shortest or easiest path from the N pole back to the S pole.

In Fig. 1 these lines of force have been shown as if the piece of soft iron were not there, and by the use of iron filings on a glass plate, with the magnet underneath, it is possible to observe the directions of these lines, which go approximately as shown in the figure. If the piece of iron were located as shown in the dotted position, these lines would go from the N pole direct to the iron, then through the iron and from the iron to the S pole, instead of taking the curved paths that are indicated. This new path through the iron, and the tendency of the lines to shorten would explain the attraction which is observed.

If instead of the piece of iron in Fig. 1, a magnetized piece of steel were pivoted in front of the horseshoe magnet, its north pole would try to point toward the south pole of the horseshoe magnet, showing that unlike poles attract. Another way to look at it is that a N pole always tends to move with the lines of force.

When we begin to experiment with a compass in the vicinity of a wire that is carrying an electrical current, we find that the wire, when the current flows, also has a magnetic effect, the nature of this action being shown in Fig. 2. The arrows along the wire show the direction of the current as it flows from the positive to negative terminal of the battery. The compass C-1 is placed on top of the wire and the compass C-2 is placed under the wire, and it is observed that the first compass has its N pole pointing in one direction while the compass under the wire points in just the opposite direction, these directions being at right angles to the wire.

From the behavior of these two compasses, and from the fact that a N pole always points with the lines of force, we conclude that there are magnetic lines of force going around the wire, and that they go as shown by the curved arrows between "A" and "B." This fact is made use of in meters, motors and nearly every type of electrical apparatus, so that it is important to be familiar with the way in which electricity produces magnetism.

A rule commonly used to remember the direction of the magnetic field or lines of force is called the "Right Hand Rule," for assume that you should grasp the wire in Fig. 2, at the part between "A" and "B" in such a manner that the extended thumb would point in the direction that the electrical current flows, then the fingers of this same right hand in curling around the wire, point in the direction of the magnetic field.

Referring now to Fig. 3, we have a wire carrying current wound on an iron rod, and the direction of the current and magnetic field of the wire shown by arrows. It will be here observed that the magnetic effect of each turn of wire adds with each other turn to send magnetism in one direction along the iron rod, and as the iron carries magnetism much easier than air, the magnetic effect is considerable, and is observed as long as the current continues to flow. As soon, however, as the current is shut off,

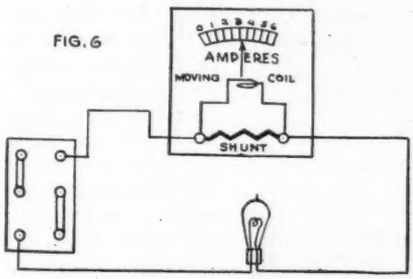


Fig. 6—The current that operates an ammeter is but a small part of the total amount passing through

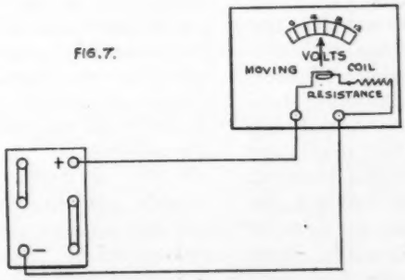


Fig. 7—The flow of current through a voltmeter is directly through the meter. Compare this with the ammeter in the foregoing illustration and it will be seen that one is a flow meter and the other a pressure meter

the iron rod is found to have practically no magnetism, so that this type of magnet is usually referred to as an electro magnet, because it depends on the action of the current for its magnetic condition. The loss of magnetism when the current stops is ascribed to the molecular condition of the soft iron, where the molecular friction is considered to be less than in steel, so that the molecules line up easily, but also turn back or demagnetize easily when the magnetizing force of the winding ceases. If a piece of steel had been used instead of the soft iron, it would have been permanently magnetized, as the molecular friction is greater, and the molecules stay lined up when once brought into position.

In Fig. 4, are shown the essential details of both voltmeters and ammeters such as are used in our trouble shooting work on the automobile. Here a large horseshoe magnet is shown sending lines of force from the N pole to a round piece of soft iron. The lines of force travel through the iron, toward the S pole, and across the other air gap, to reach this pole.

A coil of wire is also indicated, it being pivoted at the center of the soft iron "island," but not touching this piece of iron. The sides of this coil are indicated as a black dot in the right hand air gap and as a circle with a cross in it in the left hand air gap. The black dot is shown enlarged at the right of the figure, and we will assume that current is allowed to flow up or toward us on the right side of the coil, while on the other side of the coil the current flows down, or into the paper as indicated in the enlarged circle and cross at the left of the figure.

Using our right hand rule we grasp the right side of the coil with the thumb pointing upward in the direction in which the current flows and find that the magnetic lines due to this current go around the wire left hand or counterclockwise as shown by the arrows. In similar manner the lines of force around the left side of the coil go in the opposite direction.

Considering the combined effect of the magnetism due to the current in the wire, and the lines of force of the permanent magnet, we find that they add up on one side of the wire and neutralize each other on the other side of the wire, as indicated by the direction of the lines of force in the two air gaps. Now remembering that lines of force can be

(Continued on page 37)

EDITORIAL

Determining the Ideal Road

THE Lincoln Highway Association is to be congratulated upon the stand it has taken in presenting to America, what in the end will be an ideal section of highway. Much has been written regarding good roads and better roads but just what constitutes an ideal section of roadway has been problematical. Briefly speaking, the ideal section is to be a relatively short section of highway so located that it will be readily accessible from all parts of the country for the purpose of instruction and placed also, where it will carry a representative and diversified traffic.

In its effort to determine what constituted an ideal section of roadway the association appealed to all America and particularly those engaged in practical road building and those close to the problems which confront the road builder and user. Then the highway engineers of America were appealed to. These replies from all these various sources were then classified and tabulated and this winter a committee was appointed to represent the various phases of interest in highway construction and to finally draft the specifications of the ideal roadway section.

The committee has made some excellent recommendations regarding the width of road, the kind and thickness of paving material, ditch constructions, curves, lighting, markings, safety and convenience of the traveling public. The various specifications will be fitted to a specific location not yet determined upon and it is hoped it will not be long before the American public can drive over and inspect an actual section of ideal road.

Slow Salesmen

REFERENCE to laxity in the salesroom at this time when so much has been said on the subject seems like needless repetition, but we must cite an instance that occurred recently when two prospective customers walked into an accessory store, prompted by an unusually attractive window display showing some special motor car headlamps.

The interested prospects entered the salesroom and again viewed the attractive headlamps, this time displayed in an electrically lighted display counter. Everything was arranged so as to create the maximum of interest in the prospect's mind. Here though the sales efforts stopped dead. No interest was displayed by the salesman for there was no salesman present. A few minutes were spent by the men looking the place over, so to speak, while waiting the services of a salesman. The minutes lengthened until about twenty were wasted before a salesman appeared. By this time the watchful waiting had killed about all the interest in the lamps the prospects ever had, and when the salesman inquired if there was anything in which he could interest them, he was given cold thanks for his belated attention. Then as a secondary consideration the prospects merely wanted to know the price of the lamps.

If the prospects had decided to buy the lamps, the salesman would not have been responsible in particle of a degree for selling them. The prospects would have had sold themselves, induced partly by the clever window decorator, but as far as salesmanship was concerned the salesman was like the vacuum that Secretary Hughes referred to when talking of Soviet Russia.

A condition such as presented here, and by the way we wish to vouch for the absolute truth of every word, might be as well met by a mechanical salesman. A talking machine could be rigged up so as to start talking when the door is opened by the interested prospect. The "canned" line could be forced down the throat of the prospect, and by convenient arrows said prospect could be directed to the cashier where he would pay down his money, and carry out his purchase. We feel that such an arrangement would suit far better where no salesman is present to take care of customers.

We must quit being order takers in this automotive business if we are to succeed.

Free Service

NO ONE has, as yet, drawn a definite line on free and chargeable service. It is doubtful, in fact, whether a too definite line can be drawn because there are so many exterior factors that enter into the service business. There is, for example, the matter of friendship between dealer and customer which is especially the case in the smaller towns. It is gratifying, however, to note that the dealers operating service stations are beginning more and more to put their service, especially that rendered to the new car owner, on such a basis that free service is handled as a separate institution. Generally this is accomplished by having a definite understanding with the owner at the time he buys his car so that when occasion for service comes up and the question arises as to whether or not the work should be paid for, it is automatically taken care of by such things as an inspection chart which has been filled out by some responsible party in the service station, signed by the manager or dealer and also the owner himself. It is in this definite understanding between dealer and customer where the majority of troubles incurred in the service stations are eliminated. It does not suffice for the dealer to tell the car owner to drive around any time he has trouble and he will be taken care of. It must be handled like any other business transaction, in black and white.

The automobile carries, at some stage, practically all of the products of the steel mills, and tons of freight carried by the railroads.

The influence of the automobile is felt in every industry.

Tractor Demonstrations This Year to Number at Least One

Manufacturers Take Up Question in Discussing Situation at Chicago Meeting

CHICAGO, April 23—While the reports of actual business in hand now were not encouraging and manufacturers' representatives were reluctant to make any predictions of what the future would bring forth or when there would be a renewal of buying, a spirit of optimism pervaded the spring convention of the Tractor & Thresher Department of the National Implement & Vehicle Association held in this city yesterday. Most of the tractor manufacturers were represented.

Temporarily the buying power of the farmer has been destroyed. Unable to dispose of his crops or his cattle at a profit, from the standpoint of his expenditures, he is practicing the utmost rigid economy along all lines. Little blame was attached to the country banker as conditions are today. There is no need, according to the expressed opinions, to sell him on the tractor idea for he is already sold. But he has no money to lend to finance tractor sales or any other kind of sales.

Salesmen Must Be Salesmen

Little was said at the meeting as to means to adopt to meet the situation unless it be in the statement of Finley J. Mount, the chairman of the department, who urged less talk and more hard work or in the statement of other manufacturers that salesmen must become salesmen again and relinquish the position of mere travelers.

To cope with the misrepresentation by interests opposed to the tractor industry that has been and is being made and to present correct information to the farmer, to agricultural colleges and others through farm papers, country weeklies and other mediums the association has established the Power Farming Bureau with headquarters in this city and it is felt that this department will do much toward setting the doubting farmer right when the time comes for him to invest in farm machinery. This department received the hearty cooperation of the manufacturers' representatives present at the meeting, their attitude promising the working out in full of the plans which the bureau already has arranged.

At least one tractor demonstration will be held this year, the time and place to be left with the Tractor Show and Demonstration committee of which the personnel was announced by J. B. Bartolomew, Avery Co. Mr. Mount of Advance Rumely Co., is an ex-officio member. The other members are E. J. Gittins, J. I. Case T. M. Co., G. B. Sharpe, Cleveland Tractor Co., Harry Bates, Bates Machinery & Tractor Co., J. A. Everson, International Harvester Co., G. L. Gillette, Minneapolis Steel & Machinery Co., Donald McDonald, Avery Co., and A. H. Gilbert, Rock Island Plow Co. There will probably be four demonstrations. The question of a show was touched upon and this matter will be left with the committee.

It was also felt that the present disposition of the War Department against further distribution of tractors which it owns or the transfer to the Highways Bureau of the government for use on Federal aid highways would prevent any action along this line other than that already taken in the distribution of 2500 War Department owned machines. And it was also felt that in order to encourage sales among townships and counties of road building tractors the government owned machines which have been given for distribution should be distributed without further delay. Many townships are still waiting before making purchases in the hope that the government will incline toward them.

Fordsons Leave River Rouge Plant at Rate of 200 Daily

Detroit, April 22—Two hundred Fordson tractors are leaving the assembly line at the River Rouge plant every day now. The plant reached a daily production of 200 on March 24 and a few days later hit 225. Since the first of April, however, the output has averaged 200 daily, which schedule will be continued. Up to April 7, 2,557 Fordsons had been built. There has been a proportionate increase in the number of men employed since production at the tractor plant was resumed in February.

Distribution has been scattered throughout the east and middle west with 305 Fordsons having been sent to Canada in the last two weeks. They were shipped to the Ford Motor Co. of Canada and from there to the Ford motor branch at Toronto for distribution. Large numbers of Fordsons were sent to Connecticut, Pennsylvania, Wisconsin, New York, Indiana, Ohio and Illinois.

The big plant at Highland Park is increasing production of passenger cars and trucks daily and while the schedule of 90,000 was fixed as the maximum for April, up to April 10 107,719 cars and trucks had been requisitioned for the month. During the first three months of 1921 the demand for Ford cars and trucks greatly exceeded production, officials declare, and on April 1, with a total production during the three months previous amounting to 127,074 cars and trucks, the company had 102,000 unfilled orders on its books.

MADISON MOTORS SOLD

Indianapolis, April 22—Real estate, machinery, automobiles and automobile supplies, formerly owned by the Madison Motors Corp., of Anderson, were offered for sale at auction but the only bid for the factory building and premises, including eight and one-half acres, was $34,000. It was announced that this would not be accepted since the property was valued at nearly twice the amount of the bid. The auctioneer then proceeded to dispose of machinery and supplies, which were sold in parcels.

Ask California Governor to Proclaim "Automobile Day"

Dealers Petition Executive to Set Aside May 14 for Suitable Program

LOS ANGELES, April 22—Governor Stephens of California has been petitioned by the motor car dealers of the state to proclaim May 14 as "Automobile Day." The idea originated here, and if the governor takes the action requested plans will be developed to make the date worthy of its name. Anticipating favorable action, the Los Angeles Dealers' Association has appointed a committee to prepare a suitable program.

The local dealers are very much enthused over a series of events of a miscellaneous nature to keep the motor car constantly in public interest. The association's annual outing will be held early in May. This will be a closed event, but the public will be urged to participate in some of the others. During the latter part of May a run to Big Bear Valley will be staged. The Big Bear region is located on the famous Rim of the World road, a mile high and 125 miles from the city. Ezra Clark, representing the N. A. D. A., is scheduled to hold public meetings here May 5, 6 and 7.

Breaking Records

There has been an epidemic of speed contests over California's highways recently. Records have been broken all the way from San Francisco to Phoenix, Ariz. These always are subrosa events until after they are over. The justices and supervisors have entered a protest against speed tests on the roads and threatened prosecution. A few years ago when these record runs were common, the sheriffs of the state got an agreement out of the dealers to discontinue the practice. It has broken out anew now, and in order that dealers may show just how much speed their cars have and not do it on the highways at the risk of jail sentences the Speedway association has offered its plant for a series of races. A committee to canvass dealer sentiment on the subject of a stock car race has been named by the association.

INCORPORATE WHEEL COMPANY

Detroit, April 22—The Prather Wheel Mfg. Co. of Detroit has been incorporated with capital of $1,000,000 by Frank M. Prather and Frank Eack both of Detroit. Prather is the inventor of a resilient truck wheel which has been produced in small quantities in a shop in Detroit, and which it is claimed is now being used on the rear of several passenger cars in experimental tests equipped with standard truck tires. Prather says he is not at liberty to announce the future plans, but it is understood it is the intention of the company to secure a plant sufficient to permit of quantity production. The plant, however, will be used practically exclusively for assembling, the company securing the wheel parts from other factories.

Goodyear Bond Offering Is Oversubscribed by Millions

Control of Company Passes From F. A. Seiberling, President, to Banking Syndicate

NEW YORK, April 23—Control of the Goodyear Tire & Rubber Co. has passed from F. A. Seiberling, now the president, to a syndicate headed by Dillon, Read & Co., New York bankers, which has underwritten $30,000,000 first mortgage 20 year 8 per cent sinking fund gold bonds due May 1, 1941. This offering shortly after being presented to the public, it is announced, has been oversubscribed by about $20,000,000.

During the life of the bonds the management of the company, with the right to elect a majority of the directors, will be vested in Clarence Dillon, John Sherwin, chairman of the board of directors of the Union Trust Co. of Cleveland and Owen D. Young, vice president of the General Electric Co., or their successors, through management of stock or a voting trust. Some changes in the present personnel is expected.

The syndicate which has underwritten the bonds includes Goldman, Sachs & Co., which a few months ago made a temporary loan of $15,000,000, the National City Co., The Guaranty Co., Lee, Higginson & Co., the Chase Securities Co. and Blair & Co. The bonds were offered at 99 and the mortgage provides for the retirement of the entire issue at 120 and interest by drawing by lot $750,000 on each interest date beginning Nov. 1, 1921.

The proceeds of the first mortgage bonds together with the proceeds of $27,500,000 10 year 8 per cent debentures, which will be offered to stockholders will be used to pay the company's current obligations and to increase working capital. The mortgage provides that the company must maintain at all times net current assets equal to 125 per cent of the entire amount of bonds outstanding.

Approximately 70,000 stockholders and merchandise creditors assented to the plan for reorganization as presented by the bankers.

To Continue Biddle Company and Add Another Car to Line

New York, April 22—The plant equipment and assets of the Biddle Motor Car Co. have been purchased from the receiver by Ralph R. Owen, F. L. Crane of Cleveland, R. W. Stanley and associates who will continue operations under the name of the Biddle Crane Motor Car Co. Crane will be president of the company, Stanley vice president and Owen general manager. Stanley was associated with the old company.

Operations will be continued with practically the same models as those previously built by the Biddle company and it is the purpose of the new owners to turn out a small high class job which will sell at around $3,400. No attempt will be made to reach quantity production and if 200 cars are built this year the new owners will be well satisfied.

The Biddle car enjoyed an excellent reputation and the failure of the company was considered unfortunate. The inventory which was on hand at the time the receiver was appointed was adequate to complete a considerable number of cars except for two or three essential parts. A few thousand dollars would have permitted the purchase of these materials and the company could have weathered the storm but this money was not forthcoming.

Outdoor Automobile Carnival in Place of Show in Iowa City

Mason City, Ia., April 22—The date for the automobile show here has been set for Saturday, May 7, when an outdoor automobile carnival will be held on several prominent streets of the city. The streets will be decorated and a special lighting system installed. If the weather is unfavorable it will be held one week later. A parade will be held early in the day, and a street dance in the evening. A band has been secured and several band concerts will be given. Seventeen different automobile firms will exhibit. Six firms will show tractors of several different makes. Two firms will have displays of used cars and several accessory and gas and oil firms will have exhibits.

OUT TO SAVE TEXAS COMPANY

Chicago, April 22—L. S. Maremont, president of the Maremont Mfg. Co., one of the principal creditors of the Texas Motor Car Assocation, has sent a letter to creditors of the Texas company which is now in receivership urging concerted action which will permit continued operation of the plant in such a way that creditors will realize a substantial sum on their claims. In his letter he asserts that unless operations can be continued there will be no equity in the plant for the creditors. The only assets are the plant equipment and inventory. The investment in the factory aggregates more than $1,000,000 but there are mortgages against it amounting to $250,000. The liabilities are something over $500,000.

RALEIGH BUILDING TWO CARS

Bridgeton, N. J., April 22—The Raleigh Motors Corp., is now building a four and a six cylinder passenger car. The six is to sell for $2750 and the four for $2050. Details of the six cylinder model disclose the use of many standard parts such as Herschell-Spillman engine, Spacke axles, Westinghouse starting and lighting, Stromberg carbureter, Gemmer steering and Stewart vacuum system.

N. J. TRADE TO MEET MAY 12

Newark, N. J., April 22—The annual meeting of the New Jersey Automotive Trade Association will be held in Newark the afternoon of May 12. In the evening the annual dinner of the Newark Automobile Trade Association will be held with the state delegates as guests.

Only Automobile Gas Subject to New Tax in North Carolina

Rebate Will Be Given Other Users—License Fee on All Cars Increased

RALEIGH, N. C., April 20—North Carolina's new tax of half a cent a gallon on gasoline is now in effect. This tax is levied for the purpose of adding to the road fund and is expected to provide half a million dollars. The state has made arrangements to collect the tax from the wholesaler, in most cases, and the wholesaler will add half a cent to his price to the retailer. Gasoline used for any other purpose than driving automobiles is exempt from the tax and the user will be given rebate tickets.

Automobile owners will also have to pay the state a little higher license tax this year than previously. The proceeds of the license tax are also to be used for road construction and maintenance. It is expected to yield about $2,250,000. The automobile owners will thus pay into the state treasury for road work the sum of $3,750,000.

The new tax schedule is as follows: Fords raised from $10 to $12.50; little sixes from $10 to $20; big sixes and eights from $20 to $30 and $40; trucks from $20 to $30 and $40. These are merely the general classifications. The amount of taxes for the various types of automobiles will depend on the horsepower they develop. This same method was used last year, but this year the tax will be a little higher on all makes of cars.

Ford Branch in Des Moines Is Now Working at Full Capacity

Des Moines, April 22—The Des Moines Ford branch is now working at full capacity and has three forces of 400 men each employed at full time. The plant is daily turning out 165 coupe and sedan bodies, 160 cars and 100 tractors. Cars and tractors are being distributed in Iowa while the bodies are shipped into southern and western territory, according to W. K. Edmunds, branch manager. That the low priced car is the only one which is meeting with a ready sale in Iowa under present financial conditions is shown by the fact that in the March registrations of Polk county in which Des Moines is situated nearly eighty per cent of the cars registered were Fords.

DEALER SUES RAILROAD

Pekin, Ill., April 22—The Conaghan Motor Co. has filed suit for $2,000 damages against the Chicago & Alton railroad and the Chicago Junction Co., alleging loss incurred through failure to deliver a shipment of cars which were lost in transit last fall at the time Ford began his price cutting. The shipment was enroute 10 days, the complainant averred, and the market dropped, a loss which the dealer company had to suffer.

Completing Plans for Truck Dealer Branch of N. A. D. A.

Field Circularized by Moock, Replies From Manufacturing Executives Showing Hearty Cooperation

DETROIT, April 22—Plans for affiliation of the National Motor Truck Sales Managers' Association with the N. A. D. A. rapidly are being completed, and at least 500 memberships from the truck end are declared to be assured within a short time. Don F. Whittaker, secretary of the sales managers' association, has circularized the truck field and replies in most instances assure hearty cooperation of the manufacturing executives in the plan to have all truck dealers affiliated with the truck branch of the N. A. D. A. Harry G. Moock, manager of the N. A. D. A., spent a portion of last week in Detroit conferring with Mr. Whittaker and leading truck manufacturers, all of whom showed an interest in the plans and assured Mr. Moock they would lend every effort possible in bringing it to success.

Policies outlined by the Sales Managers' Association through the efforts of Mr. Whittaker rapidly are bringing the organization to the front. One of the chief features evolved by Mr. Whittaker, is the employment bureau which already is functioning with marked success. The bureau serves as a clearing house for men seeking positions and for executives seeking men. The man with a clean record has nothing to fear in making application, but on the other hand, the company is protected from the bad actor through the searching investigation conducted by the employment bureau. The active cooperation of executives assures success for the bureau plan and the fact that already more than a score of sales managers have filed their applications with the information required, indicates that they look upon it most favorably.

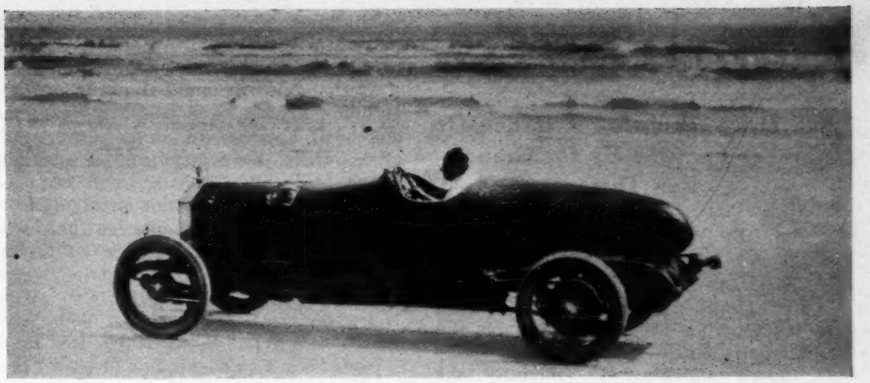
Application blanks upon which information must be furnished will give a clear record of the applicant almost from his birth with all former connections and with references from at least five reputable persons, are furnished by the bureau. The information submitted then is carefully investigated and a recommendation endorsed thereon for reference. It is expected before long to have the records of practically every man in the industry in the card index file.

PIERCE-ARROW AT CAPACITY

Buffalo, April 22—The Pierce-Arrow Motor Car Co. shipped 280 passenger cars in March and April schedules call for 300. This is approximately capacity production for the passenger car plant. Sales of motor trucks still are slow.

MULLINS BODY WILL MOVE

Salem, Ohio, April 22—Because of labor trouble in its plant here, the Mullins Body Corp. announces that it has taken an option on a fully equipped plant at Detroit and will be in a position to start operations there on a large scale in a short time. The labor difficulties developed a month ago after the corporation announced a nine hour day to which the men objected and were locked out. Subsequently every large plant here adopted the same policy and as a consequence the five largest factories of the town are closed. The Mullins corporation has a large number of orders on hand and it was deemed wiser to open a factory in Detroit than to await a settlement of the difficulties in this city.



Breaking the World's Stock Car Record

Daytona, Fla., April 22—A Roamer stock chassis equipped with a four cylinder Duesenberg engine established a new world's record at Daytona beach today the time for a mile being thirty-four and twenty-six one-hundredths seconds or one hundred and five and eight one-hundredths miles per hour. The car was driven by L. F. Goodspeed, an amateur driver. New records were also established for kilometer, two, three, four and five miles. The time for five miles was two minutes and fifty-three and forty-eight one hundredths-seconds or at the rate of one hundred and three and seven-tenths miles per hour. The mile record beats recent record by Mulford by three-quarters of a second, or by over two miles per hour

Asks for Lower Freight Rates on Shipments of Motor Trucks

New York, April 22—A plea for revision of freight rates on motor trucks charged by western railroads was made before the Consolidated Classification Committee here today by J. S. Marvin, general traffic manager of the National Automobile Chamber of Commerce. He urged that they be placed on a second class basis subject to a minimum weight of 12,000 pounds. This adjustment already has been granted by eastern and southern roads. The western roads charge first class rates on both trucks and passenger cars.

Classification of several automobile and truck parts also was discussed at the hearing. The change in classification is of great importance to manufacturers and dealers because it would mean a difference of from $40 to $80 and more a carload on trucks shipped to points west of Chicago. The Consolidated Committee has entire control of freight classification under the reorganized railroad system. The hearing was attended by a large delegation of motor car and parts makers. A decision is expected early in May.

Discontinues Buick Plant in St. Louis Moving It to Flint

General Motors Announces It Will Concentrate All Manufacturing Operations at Latter City

ST. LOUIS, April 21—The Buick plant of the General Motors Corp., Natural Bridge avenue and Union Boulevard, is being moved to Flint, Mich. The home of the Buick company, the transfer of the equipment and much of the machinery has been going on for several days. All except office equipment has been moved, it was said at the plant today.

The purpose of the move could not be learned from L. E. Kurtz, general manager. "We are not yet ready to make any announcements," he said. J. S. Hunt, manager of the Chevrolet plant, which occupies half of the $4,138,000 structure, said: "Buick cars will hereafter be manufactured exclusively in Flint, Mich., where the General Motors Corp. already has its largest Buick plant. We are unable to say at this time what use will be made of the St. Louis plant." He denied that the building would be used by any other than the General Motors Corp.

Construction of the plant on Natural Bridge road started in April, 1919, on forty acres of a 105 acre tract.

New York, April 23—Confirming the discontinuance of the Buick St. Louis branch, General Motors Corp. today issued the following statement:

"The Buick Motor Co. has removed all machinery and equipment from St. Louis and will for the present concentrate all manufacturing operations at Flint. Plans for the future utilization by General Motors Corp. of the plant at St. Louis have not yet been formulated."

Chassagne's Entry Brings Him Fourth Time to Indianapolis

Will Drive Peugeot, Returning to France Immediately for Grand Prix There

By W. F. BRADLEY

European Correspondent of Motor Age

PARIS, April 8—Jean Chassagne has just entered a Peugeot racing car for the forthcoming 500 mile grind on the Indianapolis track, where he will make his fourth appearance. Officially the Peugeot company is out of all racing for this season, but owing to the intervention of Jules Goux two of the cars which had been begun for the French Grand Prix have been completed, and one of these has been given to Chassagne and the other will be entrusted to Howard Wilcox. Owing to his business engagements, for Goux is Peugeot agent in Paris, it is impossible for the winner of the 1913 race to come to America this year.

Chassagne's Peugeot is a four-cylinder model of 80 by 148 mm. bore and stroke with cast cylinders and four valves per cylinder in the head, on the same general lines as the pre-war Peugeots. Last year's design, with three camshafts and five valves per cylinder, has been abandoned. Weight has been kept down very low and will be only a little more than the minimum imposed by the racing rules. Road tests recently carried out show that the car has a sufficiently high turn of speed to be a possible winner in the Hoosier contest. As Chassagne is under a contract to drive a Ballot car in the French Grand Prix on July 25, he will return to France immediately after the Indianapolis race. Probably the Peugeot will be sold in America.

Paris, April 8—Ralph de Palma on an eight-cylinder Ballot and Rene Thomas on a Sunbeam with the same number of cylinders, will be the first pair to be sent away in the French Grand Prix race—the first of its kind since 1914—at 9 o'clock on the morning of July 25. This order of starting was decided on by the drawing of lots this week. Ernest Ballot, having been the first to make an entry for the French race, was given the privilege of taking the first dip in the hat, when he drew forth No. 1, which he promptly declared was for Ralph de Palma. The drawing of lots merely gave the order in which the cars should be sent away, and the numbers they shall carry, leaving it possible to change drivers on any team.

1 Ballot (R. De Palma)	10 Talbot II
2 Sunbeam (R. Thomas)	11 Talbot-Darracq II
3 Mathis	12 Duesenberg II
4 Talbot I	13 Fiat II
5 Talbot-Darracq I	14 Ballot III
6 Duesenberg I	15 Talbot-Darracq III
7 Fiat I	16 Duesenberg III
8 Ballot II	17 Fiat III
8 Sunbeam II	18 Ballot IV
	19 Duesenberg IV

The start of the race will be given in pairs at intervals of 30 seconds, the first pair going away at 9 o'clock.

After having completed a set of four cylinder racing cars the Fiat company has built a series of eight-cylinder engines which have just completed their bench tests and probably will be used in the Grand Prix. If this new engine is retained by the Italian concern there will be 18 cars with eight-cylinder-in-line engines and only one with a four-cylinder power plant.

GUYOT WINS CORSICAN RACE

Paris, Special Cable—M. Guyot won the 100,000 franc Corsican Grand Prix 183 cu. in. race over a mountainous course. The average was 45 m.p.h.

Indianapolis, April 22—Officials of the Indianapolis Motor Speedway are expecting approximately twenty-five entries in the race to be run on May 30. Work has started on repairing the stands and track where repairs are needed and the first entries are expected to arrive at the speedway shortly after May 1. Maj. William P. Carpenter, who, since the speedway was built, has had charge of the policing of the track and grounds, has arrived in Indianapolis. The Major is a familiar figure to mechanicians and drivers.

Because of the fact that May 1 is Sunday, entries will not close until the day following. Many of the cars will not arrive until the final event of the Pacific coast racing season at Fresno, April 30, but most of them are expected to be at the track warming up by May 10.

Truck and Axle Companies Considering Consolidation

Kenosha, Wis., April 21—Consolidation of the Winther Motor Truck Co., the Kenosha Wheel & Axle Co. and the Marwin Truck Corp. will be announced April 29 if the stockholders ratify the action proposed by the directors and they are expected to give their assent.

There is a strong probability that this combination will be expanded later by the addition of a half dozen representative truck manufacturing companies. Under the plan proposed each factory would manufacture a truck of one capacity.

The chief obstacle thus far to the larger combination has been the question of financing. The bankers approached on the subject are understood to have given it their approval but have advised waiting a few months until conditions improve in the money market.

THEATER HEAD BUYS FRANCHISE

Atlanta, April 22—S. A. Lynch, prominent in southern theatrical circles and head of the S. A. Lynch Enterprises of Atlanta, operators of numerous motion picture theaters throughout the South, has purchased the Packard distributing contract for this territory. It is understood that Lynch paid about $100,000 for the franchise.

John N. Willys on Swing of Circuit Spreading Optimism

Reports Willys-Overland Co. Has Increased Schedule Three Times in Past Month

ATLANTA, April 22—John N. Willys, president of the Willys-Overland Co., in an address before about 100 dealers and distributors for the Willys and Overland in the southwestern territory, at a meeting held in the Atlanta branch, declared that good times are close at hand for the automotive industry and that dealers can prepare for a steady increase in business from now on until the return to normalcy has been attained.

"I do not believe we are going to experience any boom times," he stated. "A swing around the circuit convinces me that the progression of the motor car business, and of most other lines of business as well, in getting back to normal will be step by step—not with a big bound. For my part I don't want to see a big bound. We have had enough of bounds and booms. Steady progression—that's the idea. And it appears to be the direction things are taking.

"The Willys-Overland Co. has changed its production schedule three times in the past month," Willys stated, "to conform to increases in demand. The schedule is based on actual orders received, not prospective business, and therefore this fact reveals that the automotive industry is rapidly improving. Most of these orders call for delivery in this country, and only about 20 per cent of last year's exports will be made this year."

Willys declared that recent declines in the price of steel will have a marked effect on the automobile trade, and he predicted that further reduction in steel prices are practically certain to follow soon.

MATERIAL LACK HINDERS VELIE

Moline, Ill., April 22—Only shortage of raw materials supplies is halting the Velie Motors Corp. production schedule of 45 cars a day. The recent depression permitted rearrangements of factory space to install a sheet metal section in which the factory supplies its own fenders and similar parts; an enameling department and a storage battery department, which maintains battery efficiency for cars delayed in shipment.

A MAXWELL PLANT SALE, MAY 12

Detroit, April 22—A final court decree directs the sale at public auction of the Oakland avenue plant of the Maxwell Motor Co., Inc., on May 12. The minimum bid acceptable is $10,925,000 under the court order. The sale will be a part of the reorganization plan under which the Maxwell company will be merged with the Chalmers company.

Bill to Segregate Revenues Brings Other Complications

Measure Introduced by Oregon Senator May Block Industry's Efforts on Tax Question

WASHINGTON, April 22—Introduction of the Stanfield bill providing for a Federal highway fund through the segregation of revenue derived from automobile taxes has brought new complications for the industry. It is understood that the National Automobile Chamber of Commerce is opposed to the principles contained in the Stanfield amendment because it believes it would practically perpetrate the war-time taxations.

Indications are that the industry will have a fight on its hands in opposing this proposed fiscal legislation because it has the endorsement of leaders on the Senate Finance Committee.

This amendment transcends in importance other tax proposals, principally because it may eventually block efforts of the organized industry to have the excise tax repealed. It is stated that the taxation committee of the N. A. C. C. will adopt a practical program opposing this plan. It is evident, however, that they must proceed with caution if it is to adhere to the plan for a national highway system.

Bitter Fight Expected

Senator Penrose has announced that tax hearings before the Senate Committee on Finance would start after the Senate had disposed of the Emergency Tariff and its companion measure, the anti-dumping bill. Hearings have been held here this week on the affiliated measures and a bitter fight is expected when the bill is reported out of the Finance Committee. Senator Penrose has announced that he will personally direct the campaign on the Senate floor. Hence, it will not be possible to hold hearings on Internal Revenue revision for several days. If the well laid plans of Senate leaders are fulfilled, the tax discussion before the committee will begin about the first week in May. Senator Penrose, however, does not expect to have the tax measure written into the statute before September. Therefore, whatever measures are finally adopted by Congress must of necessity be largely retroactive, as the fiscal year will be well under way when the revenue bill is enacted.

The anti-dumping bill, which passed the House as part of the emergency tariff, has met considerable opposition in the Senate, particularly as to the exchange items. It is expected that the exchange provisions of the anti-dumping bill will do much to check the influx of surplus war materials, including motor trucks which have been sold in large quantities by foreigners at prices far below American production costs. It is believed that in making the exchange provisions retroactive that the large profits derived from the sales of surplus trucks on American markets would, to a large extent, be wiped out.

Senator Smoot of Utah has declared that he will oppose a permanent anti-dumping measure which does not contain provisions applicable to re-importation of trucks. Automobile dealers of the west and middle west have appealed to the Utah senator to protect them against unfair foreign competition. They claim that the sales of American made trucks originally sold to the army, and then resold as surplus to foreigners, are being offered on domestic markets here at prices which they cannot meet.

Automobile Situation Brings Cheer to American Industry

WASHINGTON, April 22—Survey of business conditions during March as completed by Archer Wall Douglas, chairman of the Committee on Statistics and Standards of the United States Chamber of Commerce, convinces him that "the most significant, and possibly the most cheering feature of the situation is that the automobile business seems to have been not dead, but sleeping. There is a resumption of operations in a modest way by some factories which have shut down, but which now have orders in hand. Also there is increasing sale for used cars."

This message to American industry has been sent broadcast and it is believed will exercise a good influence on other branches of trade. Mr. Douglas' analysis of his agents' reports showed that the volume of distribution by jobbers and retailers indicates a distinct gain in March as compared with February. He believes that excessively high railroad rates are one of the serious handicaps of the situation.

HIGHLAND BODY EXTENDS

Cincinnati, April 22—The Highland Body Mfg. Co. has redesigned its line of bodies and cabs to permit of shipment in knock-down condition and so that this will not impose additional burdens on the truck manufacturer or dealer has established branches in Detroit and Chicago. The latter branch is the latest to be opened and is located at Calumet and Cottage Grove avenues with P. H. Willis, formerly of the Detroit branch, in charge. J. R. Carr succeeds Mr. Willis at Detroit. These truck equipment stations with others managed by wholesale distributors in other large centers are for the purpose of more efficiently serving the truck dealer. The chassis is delivered to the equipment station as it is received from the manufacturer and when it leaves the equipment station it is ready for the road.

Michigan Dealers Confer to Prepare Way for Organizing

Forty Delegates Present at Detroit Meeting Adopt Tentative Constitution and Bylaws

DETROIT, April 22—Plans for formation of the State Automobile Dealers' Association were given an auspicious start at a meeting at the Statler Hotel Tuesday attended by 40 dealers representing a score of cities and towns throughout Michigan. The delegates were enthusiastic over the proposed organization, realizing the benefits accruing to the industry from the operation of the national association. The formal convention at which constitution and bylaws, in conformity with those of the national association, will be adopted, will be held in Detroit May 10 and 11. A canvass among the delegates here indicates that between four and five hundred would be in attendance and ready to sign the organization roster at the state convention.

A program is being outlined for the convention by Harry G. Moock, manager of the N. A. D. A., in which important figures in the industry will discuss topics with which they are particularly familiar. Percy Chamberlain will be on the program to discuss "Selling Service Intelligently." Another speaker not yet selected will discuss the financial end; still another will talk on sales. The used car problem will be handled by a man who has evolved a system for handling the used car business which is said to be more successful than any other now in operation. This feature will be stressed, as it is realized that the handling of used cars is the big factor confronting the dealer today.

Adopt Tentative Rules

A tentative constitution and bylaws was adopted by the delegates and put into the hands of a committee for revision and formal presentation to the convention. The committee is composed of G. E. Northroup, Grand Rapids, Harry R. Graham, Detroit and R. E. Fair of Kalamazoo.

A membership committee was named consisting of Guy O. Simons, Detroit; William Peiter, Grand Rapids; W. J. Dougherty, and J. T. Thompkins, Saginaw.

A committee on finance is composed of A. G. Loomis, Battle Creek; C. R. Graves, Lansing; A. L. Zeckendorf, Detroit; A. S. Levinsohn, Saginaw; Ray Becker, Grand Rapids and Matt Davison, Flint.

The committee on nominations which will name officers for the first year in the new association is headed by Walter Bemb, Detroit, and includes Ed. Lunt, Flint; J. J. Thompkins, Saginaw; W. B. Dunn, Jackson and Fred Kraemer, Grand Rapids.

A resolution committee is composed of C. C. Starkweather, Detroit; M. L. Garloch, Lansing; C. E. Zang, Battle Creek and Gilbert Loomis, Jackson.

Highwater Mark in Exhibits in Texas Set by Dallas Show

Dealers Believe Display Will Net 100 Per Cent on Money Expended Staging It

DALLAS, April 22—The Dallas automobile show the first of the annual spring events of its kind in Texas, just concluded here, set a highwater mark in the displaying of automobiles, accessories and equipment. The dealers went to an expense of something like $75,000 to stage the show and they believe that the investment will give a return of 100 per cent before the year is over.

The show was born of the feeling that something should be done in this section to revive and stimulate trade. It took four weeks to develop the idea and at the end of that time an exhibition hall was specially constructed, elaborately decorated and had moved into it 200 cars.

There was also put on an automobile style show with several parades connected with it.

Truck Sales Steady

While this was the automobile show for the southwest for the spring the Dallas dealers expect to put on something a little bigger during the state fair in the fall. At this later exhibition there will be displayed trucks and trailers as well as passenger cars, the former having been kept from the spring show because of lack of room.

The truck business appears to be keeping pace here with that of last year. During the past two months 200 motor trucks ranging in value from $1,000 to $6,000, the majority of them in the $2,000 to $4,000 class, have been sold and delivered by dealers in Dallas or through them. According to figures available the dealers usually sell about 1,500 trucks annually. Of the total number sold during the past two months one-third have been delivered in the immediate Dallas territory and a number to farmers both for hauling produce and for connecting to their corn shellers or silo choppers and so enabling them to shell the corn or prepare the silo for the stock. Ranchers have made extensive use of trucks.

More than 3,000 tractors for farm and road use are being distributed to users in Texas by the twenty implement dealers in Dallas. These are of all types and are going to every section of the state and with their distribution the bulk of the year's business is concluded. The dealers, however, are seeking prospects for next years' deliveries.

OGREN BEHIND ORDERS

Milwaukee, April 21—The Ogren Motor Car Co., manufacturer of the Ogren Six, is more than forty cars behind in its orders, although it has been working at full capacity throughout the last six months. In the last four weeks the plant has been operated with day as well as night shifts. A new agency established in Baltimore has ordered eighteen cars, of which three were shipped during the week. The Brooklyn agency has taken six; St. Paul-Minneapolis, three; Newark, N. J., two; Chicago, seven, and the Wisconsin distributor, ten. At the present rate of demand, the Milwaukee factory will be kept busy at maximum capacity until the end of the year. It is planned to provide additional facilities by July 1.

Advertising Policies Will Be Discussed at Detroit Meeting

New York, April 22—Directors of the National Automobile Chamber of Commerce have authorized a meeting of all advertising managers at the Detroit Athletic Club, Friday, May 6. The purpose of the meeting is further cooperation between the educational department of the N. A. C. C. and the advertising men of the motor car companies together with one or two papers of a definite character. This program will be followed by a series of five minute talks on plans and methods to be pursued in motor car and motor truck advertising plans for 1921. The meeting is designed not only to consider the best advertising policies to follow to increase sales but to consider those things which must be done to further sell the public on the position of the American vehicle in American life.

Senate Has Bill to Transfer Army Tractors to Roads Bureau

Washington, April 21—Senator Ball of Delaware has introduced a bill providing for the transfer of 1,000 five ton caterpillar tractors, complete with spare parts, 500 ten ton tractors and 200 Mobile machine shop units from the War Department to the Bureau of Roads for use in highway construction.

Senator Pittman has introduced a bill providing for a national license system for automobiles. This measure has the support of automobile organizations and is designed for reciprocity on states which have special requirements for automobile owners.

APEX REORGANIZED

Detroit, April 22—Apex Motor Corp. of Ypsilanti, manufacturers of the Ace car, has undergone a reorganization and H. T. Hanover is president and general manager, succeeding O. W. Heinz. The creditors' committee with representatives of the finance companies who are back of the Apex, have agreed to a year's extension on outstanding accounts. This covers about 97 per cent of the creditors and puts the company in good condition.

SERVICE TALKS AT DINNER

Philadelphia, April 22—The Neel-Cadillac Co. gave a get-together dinner at the Racquet club, at which addresses were made on the necessity of giving satisfactory service when a motor car is purchased and on the obligations of distributors to extend courteous attention to all owners entering the service station.

Immediate Production of New Sterling-Knight Car Planned

Company Organized to Take Over Work Carried on During Year By Syndicate

CLEVELAND, April 22—The Sterling-Knight Motor Co. has been chartered and it will manufacture an automobile using the Knight sleeve valve motor. The car will rank in the high price class although the price has not been definitely fixed.

The prime mover in the new company will be J. G. Sterling, for years engineer of the F. B. Stearns Co., which manufactures a car using the Knight engine. Mr. Sterling will be vice president and general manager. With him will be associated P. H. Withington of Toledo as president and treasurer and Alonzo M. Snyder of Cleveland as secretary. The directors in addition to the officers named are Alva Bradley, W. B. Congwer, J. V. Thomas, C. O. Mininger, R. D. Jacobs and R. H. York, all of Cleveland.

The company is chartered under the Ohio laws with a capital stock of $1,000,000 preferred and 20,000 shares of no value common stock of which 2,500 are to be known as Class A and 17,500 as Class B. The stockholders have subscribed to $250,000 of the preferred. According to report the subscriptions to this stock and the payments on it are to be handled by the Union Trust Co.

The new company takes over the work carried on during the past year by the Sterling-Knight syndicate an organization of Cleveland interests which financed the experimental work on the car. Three cars of six cylinder design have been built and tested and were exhibited at the automobile shows in Cleveland and Chicago. It is the intention of the new company to begin immediate production.

RULES ON ELECTRIC CAR TAX

Louisville, Ky., April 22—Judge Samuel B. Kirby has made permanent a temporary injunction restraining the county clerk from collecting more than 60 cents a horsepower or more than $3 for a state license on an electric automobile. Thirteen dollars has been charged as the license fee on electric cars and under the order of the court those who paid in excess of $3 will be entitled to a refund. W. Wallace McDowell brought suit to test the law as it affected electric car owners.

TIMKEN BRANCH AGAIN OPERATES

Columbus, April 22—The Columbus branch of the Timken Roller Bearing Co., started operations April 20, after a shutdown since October. Word was received by Charles N. Repogle, manager, to start operations in the screw machine, grinding and inspection departments and about 250 men were put to work. It is hoped to increase the number gradually to about 2,500.

Tire Dealers Start Move to End Bad Business Practices

Wisconsin Organization Planning to Organize Clubs Throughout State to Help Conditions

MILWAUKEE, April 22—The Wisconsin Tire Dealers' Association, recently organized with a membership now numbering over 250, has begun a campaign to clean out illigitimate practices in the business. It is calling attention to the "practice of some unscrupulous tire dealers to repair and put back on the market, worn-out tires." The association policy is stated as follows: "This association recommends that its members mutilate, by cutting in two, all junk tires before disposing of them to anyone. It is recommended that each member so mutilate these tires as to render them unfit for further service."

The association will also send out the following to all tire manufacturers: "Whereas, the practice of some unscrupulous tire merchants is to replace on the market worn-out or adjusted tires, consequently this association recommends to all tire manufacturers that they mutilate all tires received through adjustment in such a manner as to render them unfit for use or repair."

The association is also preparing to organize the state by having in every city and town of consequence, a committee of at least one dealer, "to promote interest and assist in organizing local clubs in adjoining territory."

A legitimate tire dealer is described by the association as follows: "One who sells tires at retail and whose policies are not dictated by any manufacturer: having major profits of business from the sale of tires, tubes and tire accessories, also repair men and vulcanizers, and such owners of garages who carry stock of tires and tubes for resale." This definition will be sent to all tire manufacturers.

Steel Cut But Stock on Hand Stop Lowering of Car Prices

Detroit, April 22—There is little likelihood that the reduction in steel prices will have any effect on Detroit products in the near future in the opinion of manufacturers and builders. Stocks of steel on hand and the uncertainties in the market are declared to be sufficient reasons for failure to pass along the reductions to the ultimate consumer. As far as the automotive industry is concerned, it is contended that steel figures a small percentage in the production cost of automobiles. The reduced production cost is declared insignificant as a figure in sales quotations under present conditions existing in the industry. Alvan Macauley, president of the Packard Motor Car Co.; F. J. Haynes, president of Dodge Brothers and R. H. Collins, president of the Cadillac Motor Car Co., declared that stocks of steel on hand would preclude any possibility of price changes for some time to come. Collins said automobile values might be affected to the extent of giving greater value for the same money, which advantage naturally would be passed along to the consumer, not in the form of lower prices but in a more valuable product. It is contended also that the economy made possible by the reduced steel prices will permit of improvements in factories long in contemplation and necessary to the proper construction of cars, and it is the attitude of manufacturers apparently to absorb this reduction in strengthening plants and equipment.

The Carolinas Best Show

Pryor's band and individual artists furnished the music at the Carolinas automobile show. With an abundant use of Florida moss, wistaria and southern smilax the building where the show was staged was made to look like a garden spot. Artistic lighting added to the effectiveness of the decorating scheme

ROAD BILLS IN CONGRESS

Washington, April 21—Senator King of Utah has introduced a resolution authorizing the appointment of a special committee to investigate Federal aid expenditures in the construction and maintenance of highways throughout the country. This is in line with part of President Harding's address to Congress in which he expressed the opinion that there had been waste in the distribution of Federal funds.

Representative MacArthur of Oregon has introduced a bill providing for the appropriation of $75,000,000 for highway construction. This replaces the bill introduced at the last session and defeated in the Senate.

ALBANY BILL TO RAISE FEES LOST

Albany, N. Y., April 22—The bill introduced by Senator Lusk, majority leader in the Senate, which would have increased the license fees for passenger automobiles and motor trucks, was lost in the shuffle in the closing hours of the legislature and did not pass. The law makers evidently decided that the motor industry already is bearing its full share of taxes.

Show Held at Charlotte Brings Together Dealers in Carolinas

Five Hundred From Two States Attend on Day Set Aside for Them

CHARLOTTE, N. C., April 22—The second annual Carolinas automobile show has been pronounced by all local interests, at its close, as the biggest thing of the kind ever staged here. There were about 300 exhibits including passenger cars, trucks and accessories.

Special days were arranged. One day when all dealers in the two Carolinas were urged to be present 500 of them were on hand. Society night was a feature, the booths being turned over on this occasion to the ladies.

The attendance during the week was record breaking and the enthusiasm marked. Dealers got a new baptism of optimism and the public a new conception of automobile shows and a better knowledge of the cars that will be useful to them when they are ready to make a purchase. Sales were made and a number of prospects were lined up.

The show was given under the auspices of the Charlotte Automotive Trades Association, H. D. Horton, president. The general committee in charge was E. M. Wallace, Fred Anderson and J. G. Fitzsimons.

ADVANCE RUMLEY PRICES CUT

Laporte, Ind., April 22—The Advance Rumley Co. announces a 10 per cent reduction in price on all its farm machinery in which steel is the chief raw material used. This follows the price reduction made by the United States Steel Corp.

Kansas City Reserve Board Policy Subject of Inquiry

Gov. Harding, Systems' Head, Will Investigate Relations Between Bank and Auto Industry

WASHINGTON, April 22—A personal investigation into the relations between the Kansas City Federal Reserve Bank and the automobile industry will be made by Governor W. P. G. Harding of the Federal Reserve Board, as a result of a conference here between the governor and C. A. Vane, general counsel of the National Automobile Dealers' Association.

Governor Harding promised Vane that he would visit Kansas City May 21, and at that time would take up with the directors of the Kansas City Bank the question of policy that have been pursued toward the automobile trade in that district and that he would additionally give a committee from the Kansas City Automobile Dealers' Association, which is affiliated with the N. A. D. A., an opportunity of presenting their side of the case. Vane immediately wired E. E. Peake, secretary of the Kansas City association, to get his committee and his information together for the hearing.

Governor Harding Will Speak

At Vane's request, Govenor Harding also agreed to address a gathering of representative Kansas City business men, bankers, merchants, automobile dealers and the like, and give a talk on business, economic, and financial conditions in Kansas City, Saturday night, May 21. Peake will have complete charge of the arrangements for this meeting.

Governor Harding displayed intense interest in the Kansas City district situation. As the result of information given him by Vane, the Governor said that he would tell the bankers of the State of Kansas in a speech he will make at Topeka, May 20, that if they refuse to extend credit to the automobile business or to any other business that they should admit that such refusal is a result of their own decision and not be so cowardly as to hide behind the declaration that they were acting upon instructions from the Federal Reserve Banks or the Federal Reserve Board.

No Discrimination

"No such orders ever have been issued," the Governor said. "Commercial paper is either eligible for rediscount or it isn't eligible. We never have ruled against automobile dealer paper. Under no circumstances could we order a discrimination against paper which is legally eligible. Either the member bank will accept it or refuse it. It accepts or refuses on its own decision."

Governor Harding was asked if there had been an improvement in the general credit situation and if a further improvement could be expected. To both questions his reply was "yes." The following question was then put to him:

"If there is a general credit improvement do you know of any reason why the Federal Reserve banks should single out the automobile industry for restriction?"

The Governor, after first declaring that there never had been any singling out by the Federal Reserve Board, said that so far as he knew there was no reason why the automobile business should feel any special restrictions not equally applicable to other lines of industry.

The Governor was then asked if the Federal Reserve banks and in turn the member banks were calling upon borrowers for new credit statements. To which the Governor replied:

Credit Will Be Easier

"We call for credit statements annually. I think this can be said safely now:

CREDIT STATEMENTS ARE NOT GOING TO BE SUBJECTED TO THE SAME DEGREE OF SCRUTINY THAT THEY WERE A YEAR AGO."

Asked as to whether there would be a lowering of the discount rates, the Governor said:

"The average reserve in all the banks of the country is around 53.7 per cent. On April 16 the reserve in the Boston bank had been built up to 71.3 per cent. This is the ratio of total reserves to deposit and Federal Reserve note liabilities combined. Now the rate in the Boston district has been lowered. I leave it to your own judgment as to what will happen in the other districts when this ratio has been built up. It is largely mechanical and governed automatically."

Lessened Gasoline Demand Despite Price Reductions

Washington, April 21—Price cuts failed to make any material difference in volume of gasoline consumption, as the Bureau of Mines refinery statistics for February show that the daily average of gasoline production fell off by one million gallons but the stocks increased by 108,000,000 gallons. The lessened demand was also reflected in increase of 18,000,000 gallons of lubricating oils in reserve with a decreased production of 185,000 gallons.

The figures show that there were 680,540,351 gallons on hand at the end of February. Exports amounted to 52,497,051 gallons, shipments to insular possessions 4,536,619 and domestic consumption 225,195,372 gallons. The daily average consumption was 10,079,609 gallons.

HOW THE ELECTRIC SYSTEM WORKS

In the April 14th issue of MOTOR AGE, two typographical errors occurred in the article entitled "How the Electric System Works," pages 14, 15 and 16. On page 16, in the center column, eight lines from the bottom No. 10 cable was suggested which should be No. 0. Also in the next line, instead of .01 ohms is should be .1 ohms.

Races at Uniontown Will Be Championship Point Events

Foreign Drivers Are Expected to Enter in Classics on Pennsylvania Speedway

UNIONTOWN, Pa., April 23—The Universal Trophy race of 225 miles at the Uniontown Speedway on Saturday, June 18, and the Autumn Classic, on Labor Day, a distance yet to be determined, will be championship point events, according to official announcement just made. A total of 525 points divided between the seven winners will be awarded for each race. The points are first, 250 points; second, 130 points; third, 70 points; fourth, 40 points; fifth, 20 points; sixth, 10 points; seventh, five points.

Entry blanks for the Universal Trophy events have already gone out. The fact that the local races will be championship point events will be an added incentive for the greatest drivers to enter the Uniontown races, and it is quite likely from present indications that a number of foreign drivers will also be entered in the big classic.

Ralph Mulford is here preparing to attempt new stock car records for one mile, ten miles, one hour and 100 miles on the Uniontown mile and an oval. These tests are under the sanction of the three A's and probably will be made on April 28 or the following two days.

MULLINS BODY MAY NOT MOVE

Detroit, April 22—Reports that the Mullins Body Company, Salem, Ohio, which has been beset by labor troubles, would move to Detroit, were confirmed in part today by company officials, though it was said labor troubles in Salem were nearing adjustment and in all probability the situation would be overcome and the plant would remain in that city. Officials said, however, arrangements had been made for plant space in Detroit, and for shipping machinery and equipment to Detroit by express on short notice when the trouble became acute a few days ago.

REDUCTION IN BODY PRICES

Cleveland, April 22—The United Automotive Body Co. has announced a reduction in prices ranging from 10 to 25 per cent on all its Ford commercial and passenger bodies.

The company is opening two more branch assembly plants at Detroit and Pontiac to serve effectively the entire sales organizations of motor truck manufacturers in those cities.

ROCK ISLAND PLOW PRICES CUT

Rock Island, Ill., April 22—Ten per cent reductions in all products, except tractors and tractor tools, were announced by the Rock Island Plow Co. effective immediately. The tractor plant cut prices 15 per cent a month ago.

N. A. D. A. Committee Named for Detroit Meeting in May

Dealers' Association Draws Up Statement of Principles for Discussion with Manufacturers

ST. LOUIS, April 22—With the appointment of a committee by President Jesse A. Smith to represent the National Automobile Dealers' Association and with the preparation of a statement of principles of the association to be taken up by the committee everything is set for the conference to be held on May 9 in Detroit with a committee from the National Automobile Chamber of Commerce for the discussion of general trade conditions. The N. A. D. A. committee consists of Jesse A. Smith, Milwaukee; H. B. Harper, Philadelphia; F. W. Vesper, St. Louis; A. J. Shorey, Boston; P. H. Greer, Los Angeles; and N. H. Cartinhour, Indianapolis.

The subjects that will come up for discussion are chiefly those which were taken up at the N. A. D. A. Chicago convention which resulted in the calling of the conference. They embrace eight matters which the dealers believe need threshing out:

1—Cancellation clause.
2—Discounts.
3—Exclusive representation.
4—Used car problems.
5—Parts, discounts and stocks.
6—Service policies.
7—Advertising.
8—Freight rates.

It is believed that with the dealer and manufacturers getting together on these matters much of the friction that exists now can be removed without injury to either of them or to the jobber.

The purpose of the conference, Harry G. Moock, general manager of the N. A. D. A., says is to build up permanency in the industry among dealers as well as among the manufacturers.

"In doing this," he says, "we will have to have a united industry. Manufacturer must be satisfied, dealer must be satisfied but, above all things else, both manufacturer and dealer must satisfy the customer. The industry can come nearer doing this by getting together than it can by maintaining this artificial wall that somehow or other has grown up between dealers and manufacturers. We are all one big family. There's enough trouble on the outside to take care of, without having misunderstandings among ourselves."

Sales of Premiers Improved Under Late Reorganization

Indianapolis, April 21—Work of reorganizing the old Premier company into the new Premier Motor Car Corp. is progressing rapidly, according to B. H. Miller, of this city, who represents the creditors of the organization, among which is the Fletcher American National bank. The company has been incorporated under Indiana laws, the corporation having taken over the Delaware corporation. By this method it is possible to add about $500,000 of new money. Under the new organization, J. A. Price has been named president; I. F. Schaeffer, treasurer and M. A. Whipple, secretary. Mr. Schaeffer is the only director remaining from the old organization.

Men back of the organization, including Mr. Miller, are more optimistic than they have been for some weeks past concerning the future of the corporation. A. E. Doty, the new sales manager, has begun work and, according to Mr. Miller, results already are being shown. Fifty cars have been sold during the past two weeks and today orders were received for twelve cars and thirteen were shipped from storage.

More Time Granted Gillette Rubber Co. to Meets Its Bills

Chicago, April 23—Conditions in the Gillette Rubber Co., which are being conducted by a creditor's committee appointed last October, are showing marked betterment and bankers say that the company will come out of a six months' extension which the creditors have granted in excellent shape.

Altogether the company owes merchandise creditors and banks about $1,500,000 and in addition to agreeing to allow a half year's time in collecting this the banks have announced that they would supply the company with necessary working capital in the meantime.

The trouble the company had was due to a large amount of raw materials which it had on hand and no orders. There are now unfilled orders on the books for $1,400,000 which will allow virtually the cleaning up of this inventory.

The creditor's committee is composed of H. R. Kent, vice-president of the Fort Dearborn National bank, who heads it; H. O. Seymour, vice-president of the Wisconsin National bank, Milwaukee; and H. H. Merrick, president of the Great Lakes Trust Co., Chicago.

DURYEA CAR ON MARKET IN MAY

Philadelphia, April 22—M. J. Smith has been placed in charge of the Philadelphia sales district of the Duryea Motor Corp. of Wilmington, with offices in the Parkway building, North Broad street. A limited number of cars, it is announced, will be placed on the market in May and it is expected by the company, that no less than 1,000 cars will be produced by the Wilmington plant during 1921. The new product, which, it is said, will be minus numerous parts usually found in standard cars, will seat two persons and sell at about $350.

"OPEN HOUSE" AT ROCK ISLAND

Rock Island, Ill., April 20—The Tri-City Auto Trades Association will stage a big parade tomorrow as inauguration of their "open house," which will conclude a big advertising campaign. Each dealer will conduct individual displays in his own salesroom for three days.

Georgia Dealers to Meet to Discuss Legislative Program

Revision of Automobile Theft Bill Which Has Proven Hardship Among Aims

ATLANTA, April 20—A meeting of the officers and directors of the Georgia Automotive Dealers' Association will be held the latter part of this month or early in May, the date and location to be later announced by P. A. Megahee, secretary, at which time the legislative program for the year will be discussed and committees appointed to handle matters pertaining to automobile legislation. One of the primary efforts this year will be the abolishment or the revision of the theft bill, which has proven a hardship to dealers throughout the state. Inasmuch as the bill is very favorable and of advantage to the county sheriffs the state association of these officials will be on hand to prevent any changes being made in the bill. The automotive association, through its various committees, will cencentrate its efforts on the defensive to bring about the revision of the bill. Tax matters are to also be considered, especially the tax on gas.

Just before the Georgia legislature convenes in June there will be a state wide meeting of the association at Indian Springs, Ga., and various legislative matters of interest and importance to the industry will be discussed, and further plans adopted for action during the time the legislature is in session.

New Corporation to Be Formed to Take Over Standard Parts

Cleveland, April 21—An assemblage of creditors representing $7,500,000 of the $9,500,000 outstanding obligations by unanimous vote has accepted a reorganization plan for the Standard Parts Co. The vote was taken after an all day session, in the course of which representatives of the largest creditors of the company spoke in favor of the proposed plan.

In brief the reorganization plan provides for the sale of the company's property to an individual representing the creditors. That purchaser is to resell the plant to a new corporation to be formed in consideration of $6,500,000 of mortgage notes bearing 8 per cent interest, all of the management stock and 110,000 shares of the common stock. The management stock consists of $1000 of preferred stock, consisting of ten shares of $100 each, and it is to elect a majority of the new company directors. This stock is to be under the control of a managing committee, the members of which are to be made up of the Creditors' Committee. Through this plan the creditors retain their hold on the corporation, and in the event the stockholders do not carry out their part of the plan, the creditors can go through with some other proposal.

Concerning Men You Know

N. C. Beerend, recently connected with the Walters Co., Milwaukee, in charge of its automotive advertising, has been appointed sales and advertising manager of the Jorgensen Mfg. Co., Waupaca, Wis., taking charge of this work, May 15. Mr. Beerend was formerly service manager of the Gemco Mfg. Co., and was associated with the sales and advertising departments of the Badger Mfg. Corp.

W. A. Hamill, for eight years connected with the Neel-Cadillac Co., recently as manager of sales, has been appointed salesmanager of the Sweeten Automobile Co., distributor of Lincoln cars, Philadelphia.

Fred Colver has been appointed assistant salesmanager of the W. S. Kip Motor Co., distributor of Dort and Liberty cars, Philadelphia. Mr. Colver formerly was with the General Motors Co. in its Frigidaire division.

J. Emerson, who was the purchasing agent of the King Motor Car Co. before it went under new ownership, again is connected with the company in the same capacity.

Charles B. Fullerton has been appointed manager of the accessory department of the Neel-Cadillac Co., Philadelphia, succeeding N. G. Watson, resigned, whose assistant he has been. Samuel J. Jorgenson has been named manager of the accessory department of the company's service department.

Frank P. Gmelin has organized the Frank P. Gmelin Co., Detroit, with himself as president and G. M. Harris, secretary and treasurer, to distribute the Mitchell cars for the Detroit territory. Mr. Gmelin formerly handled Mitchells in Detroit prior to 1917.

George D. Wilcox, director of sales and advertising of the Commerce Motor Car Co., Detroit, has been promoted to the position of general manager of the company. Orville D. Coppock, who has been Mr. Wilcox's assistant, becomes sales manager.

R. B. Greene has been appointed retail sales manager by F. W. Stockbridge, the Winton Co.'s Boston branch manager.

Geo. Pearson, Jr., formerly district supervisor for Maxwell-Chalmers in San Francisco, has resigned to become sales manager of Union Motors, Inc., a new Los Angeles concern handling the Maxwell.

E. E. Eby has joined the Remy Electric Co., Anderson, Ind., in the capacity of purchasing agent. Mr. Eby was formerly American director of Delco-Remy, Ltd., and Hyatt, Ltd., with offices at New York City.

George F. Conant, vice president and general manager of the East Texas Oakland Co., Houston, has resigned as president of the Houston Auto Trades Association for the reason that business requires his absence from the city much of the time.

C. E. Knauss, who for the last two years has been sales and advertising manager for the Continental Aircraft, Inc., has been made sales manager of the Stout Engineering Laboratories, Inc., in Detroit, and will assume his duties immediately. Production on the new Stout commercial airplanes will begin soon in the Detroit plant on Beaubien street.

D. Henry Bonner, recently in charge of the branch house organization of the Ford Motor Co., has been made sales manager of the Four Wheel Drive Truck Co., of Clintonville, Wis., manufacturers of the F. W. D. truck.

Edward J. Post has been appointed manager of the Chicago branch of the Oshkosh Truck Sales Co. of America, which has taken over the international selling rights of the Oshkosh Motor Truck Mfg. Co. of Oshkosh, Wis., and N. O. and S. S. Gilbert, for many years identified with the motor truck business in Chicago, have been appointed Mid-West distributors. Offices have been opened at 1509 South Michigan avenue, Chicago.

Harry W. Bryant, formerly of the sales department of the Titan Truck Co., Milwaukee, has become sales manager of Downer Garage & Sales Co., Milwaukee, distributor of the Winther line of passenger and commercial cars in Wisconsin.

Frank Gresinger, of Chicago, has been made manager of the Des Moines branch of the Goodyear Tire and Rubber Co., succeeding C. S. Saylor, who was transferred to an executive position in Chicago.

W. S. Doty, formerly connected with the Cleveland Tractor Co., has acquired a substantial interest in the Globe Motors Co., Cleveland, and will act as treasurer and have charge of operations of the company.

James E. Duffell, formerly in the sales department at the Atlanta factory of the Hanson Motor Co. and now controlling the retail contract in the Atlanta territory, will have charge of the new salesroom and service station which the company will open about July 1 in the downtown section of that city.

E. Luman Mills, formerly of the New York territory, has been appointed in charge of Klaxon sales in the Philadelphia district.

Philadelphia Protests Bill to Impose One Cent Gas Tax

Philadelphia, April 22—The Philadelphia Automobile Trade Association is protesting vigorously against the so-called Dawson bill in the state legislature, placing a tax of one cent a gallon on gasoline. This step was decided on at the latest session of the association's board of directors.

Telegrams were sent to each of the Philadelphia members of the state senate at Harrisburg, urging them not to treat the automobile as a luxury and add this burden to owners, but to recognize it as a highly important factor in transportation facilities in the business world. Telegrams also have been sent to legislators by many individual automobile dealers in protest against the proposed tax.

DEALERS SAVED $105,000

Chicago, April 21—Through efforts of the Chicago Automobile Trade Association it is estimated that $105,000 has been saved automobile dealers with the defeat of a bill introduced in the Legislature to increase the annual registration fee of the dealer from $12 for each set of demonstrating license plates to $50 for the first set of plates and $2 for each additional set. The adoption of the measure would have imposed hardship on dealers who use less than five sets of demonstrating license tags though at the same time it would have meant a decreased expenditure for the large dealer. The association opposed the measure on the ground that it was unfair to the small dealer.

Butler Again Chosen to Head Memphis Dealers' Association

Memphis, Tenn., April 21—Steve H. Butler was re-elected president of the Memphis Automobile Dealers' Association at the annual meeting of the organization held in the show rooms of the Memphis Motor Car Co. Gus F. Schlecht was elected vice-president and J. Allen Creath was re-elected treasurer. Directors of the association for the ensuing year are these officers and J. H. A. Campbell, R. F. Carr, J. F. Hicks and Owen Lilly, "father of the association" and its first president. Henry W. Osinach, secretary of the association, will continue in this capacity, his selection being vested in the board of directors. The election followed an elaborate course dinner, the rooms being decorated with blossoms, ferns and palm. In the course of his remarks, Mr. Butler thanked Frank N. Fisher, president of the Memphis Motor Car Co. which acted as host, and paid a tribute to Mr. Lilly.

More Dealers by Districts Being Organized in Indiana

Anderson, Ind., April 25—An organization of automobile dealers, which will affiliate with the Indiana Automotive Trade Association, was effected here Howard Holcomb, formerly of Indianapolis, as temporary chairman, and Charles Latham, temporary secretary. Officers will be elected for the organization April 26.

Portland, Ind., April 20—Leaders in the automobile business here conferred with officials of the Indiana Automotive Trade Association and are planning for a general meeting of the automobile business men of Jay county on Monday, May 2, for the purpose of organizing a trade association to affiliate with the state and national bodies. Randolph county automobile men will meet at Winchester about May 5 for purposes of organization, these counties completing the organization of the Eighth congressional district. Work in the Twelfth district will be started at Ft. Wayne on the night of May 3.

Muncie, Ind., April 3—Frank Hanley, president of the Muncie Auto Trade Association, said following a meeting of members of the local organization that plans for a paid secretary, for an advertising campaign to "carry our message to the public" and for an enlargement of the organization to include membership of all automotive business in Delaware county, would be placed before a general meeting May 4.

ENGINE SHOWS GET PROSPECTS

Buffalo, April 22—To show to what uses the gasoline and electric motors can be put, the Motors and Sportsmen's Show has just held in this city. While no attempt was made to place emphasis on the display of automobiles many makes were shown and alert dealers report adding many good prospects to their lists as a result of the show. One section of the show was devoted to trucks and exhibits of commercial bodies while accessory manufacturers were well represented.

ALEDO DEALERS ORGANIZE

Aledo, Ill., April 22—The Mercer County Automobile Dealers' Association was effected at a banquet at which practically every dealer in the county was represented. Officers are: A. J. Christy, New Windsor, president; Harry Dodson, Aledo, vice-president; Farr Carroll, Aledo, secretary; Robert Davidson, Joy, treasurer.

Congressman Good Still Holds That Automobile Is a Luxury

Protesting Home Dealers Regard His Attitude on Taxation as Being Unfair

CEDAR RAPIDS, IA., April 22—In spite of the fact that his urging of a wheel tax to collect $200,000,000 from passenger carrying automobiles aroused a storm of protect from motor car owners, Representative James W. Good of Cedar Rapids is still of the opinion "that to a very large extent, the passenger carrying automobile is a luxury." Mr. Good made this declaration in replying to the request of the automotive men of his own city that he re-consider his plan for the wheel tax.

The Linn County Motor Trades Bureau lost no time in conferring on Mr. Good's reply to its protest, and in its answer to him called attention to the fact that "In President's Harding's reference in his message to Congress on April 12th, 1921, he said: 'The motor car has become an indispensable instrument in our political, social and industrial life.'"

Mr. Good, in a letter replying to the protest against the wheel tax, made by automobile men of his home city and county, wrote that:

"I appreciate that no one wants to be taxed, but the expenses of running the government have increased so largely because of the war, it is absolutely necessary to discover new and more equitable fields for taxation. And while the matter of levying taxes is not peculiarly a province of the Committee on Appropriations, it seemed to me pertinent when discussing appropriations, to call attention to this, as one of the sources from which additional revenue might be had."

Automotive Industry Overtaxed

After referring to President Harding's mention of the Motor car, E. L. McKibben, writing as president of the bureau, declared that he mentioned the "necessary" issue to half a dozen representative Cedar Rapids business men, each of whom said he regarded the passenger carrying automobile as an absolute necessity.

The Cedar Rapids motor men said that Mr. Good's statement that "no one wants to be taxed" is unfair. They said the automobile industry is "perfectly willing to bear its fair share of all taxes, national, state and county, but it protests vigorously against this proposed tax, for the reason that it is now overtaxed and also because it would be adding an excessive burden to a single industry.

FORD SELLS HOME-GROWN WHEAT

Detroit, April 22—Wheat, raised on the Henry Ford farm in Dearborn and ground in the Dearborn Ford Flour Mill, now is being sold in the Ford stores at Highland Park, River Rouge and Dearborn. The flour is sold in 25 pound bags labelled Ford flour, and sells for $1.19 a bag. The Ford mill at Dearborn, which was completed last Fall, is one of the most modern in the country. It is located directly alongside of the Ford grain elevator where grain from the Ford farm is stored and cleaned. The mill is operating on such a basis as to supply the stores as fast as the flour is being sold. The wheat grown on the Ford farm is handled exclusively by Ford machinery and equipment. The ground is plowed and the wheat cut by Fordson tractors and the grain hauled to the mill in Ford trucks.

Ellingboe With Frontenac Enters Indianapolis Race

Indianapolis, April 21—First practice has started on the Indianapolis speedway. Jules Ellingboe recently tuned up his Frontenac for the 500-mile race, Decoration Day. The Howard Engineering Co. of Memphis filed his entry with the speedway officials April 20 and permission was granted for the first practice immediately. Ellingboe, who hails from Crookston, Minn., is a newcomer on the speedway, and was anxious to try out the course early so that he may become one of its most skillful pilots, having won the championship twice, as well as having lowered several records. His car is a duplicate of the one which the late Gaston Chevrolet won last year's classic.

A. J. March, Former President of Milwaukee Dealers, Is Dead

Milwaukee, April 22—Alton J. March, president of the March Motors Co., Milwaukee, distributor of the Mitchell and Gardner and the Duplex truck in the Wisconsin and Upper Michigan territory, died April 20 after an illness of six months. He was one of the most prominent men in the Northwestern motor car trade and served two terms as president of the Milwaukee Automotive Dealers' Association. Mr. March was born in Boise, Idaho, Oct. 30, 1879, and came to Milwaukee as a youth. For many years he was connected with the Curtis Auto. Co., Reo distributor, rising to the general management of the business. He organized his own company about four years ago. Mr. March was a director in the Babcock Automobile Spring Co. and numerous other enterprises affiliated with the motor car industry.

U. S. RUBBER NETS TEN MILLION

New York, April 22—Stockholders of the United States Rubber Co. were informed by Samuel P. Colt, chairman of the board of directors, at their annual meeting that earnings for the year 1920 were about $10,000,000 over and above dividend requirements and that regular dividends at 8 per cent have been paid on both preferred and common stock. The company also has met every bill as it has come due. All the directors of the company were re-elected and John W. Davis, former ambassador to Great Britain, was added to the board.

Equipment Sales, Wholesale and Retail, Show Improvement

March Less Than Last Year, but Shows an Increase Over Preceding Month

NEW YORK, April 23—Sales of automotive equipment in the New York district for March showed an increase of 20 per cent over February in retail selling and 22 per cent in wholesale, according to an investigation conducted by the research department of the Class Journal Co. Tire sales at retail showed an increase of 18 per cent and at wholesale 24 per cent.

The investigation showed a gradual tendency to maintain normal stocks of supplies, and in some cases, particularly among those handling equipment as a side line, there was a tendency to enlarge. In tires a movement toward more extensive use of cheaper grades was found, the feeling among the buying public being that higher priced lines should be reduced.

Against Selling A. E. F. Surplus

Uniformity of complaint was found in the tire trade against the selling of reimported A. E. F. surplus tires as new stock. It is thought these tires will prove defective owing to deterioration of quality through aging and that the ensuing dissatisfaction will have an injurious effect on all tires bearing these brands.

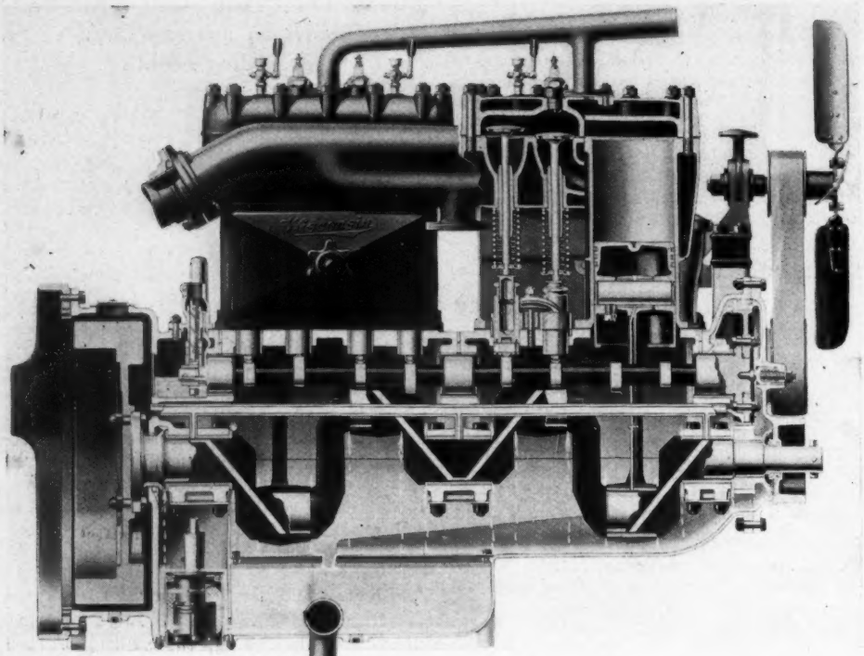
Reports received by the research department indicate that sales of equipment began to pick up about March 1 in New York, Chicago and Minneapolis and about March 15 in Boston. Sales are found to be still slow in Cleveland, Pittburgh and through the south. About April 1 there was a noticeable increase in sales reported from all over the country, and this was backed up by reports of continued increases at the end of the first week in the month.

On the whole business was found to be behind last year's figures in the equipment line in New York, the decrease ranging from 12 to 20 per cent. Practically all of the supply business was shown to be in the hands of regular equipment dealers, the sales in hardware department and sporting goods stores being negligible except where distinct departments were opened.

TRAINLOAD OF CARS FOR COAST

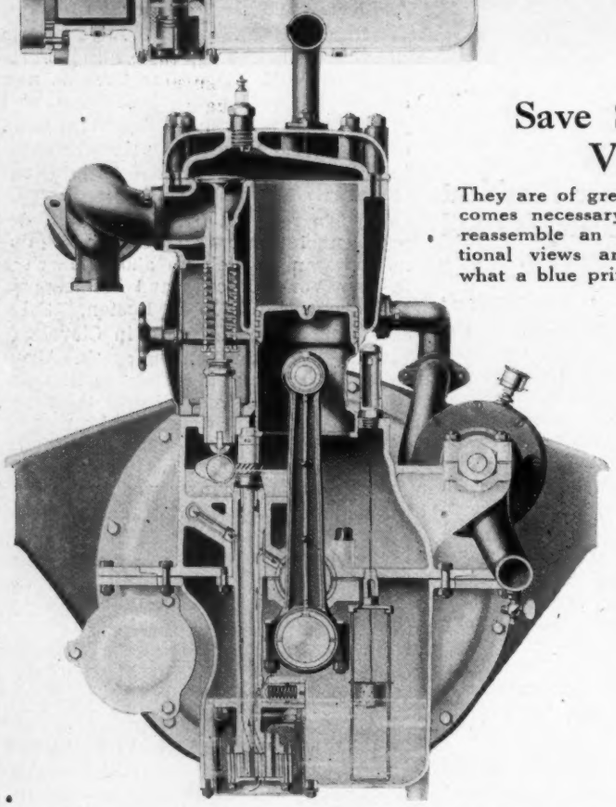
Portland, April 22—Indicative of the resumption which business is showing here is the announcement by the Oldsmobile Co. of Oregon, distributor of the Oldsmobile in Oregon and part of Washington, that arrangements have been made for sending to this district an entire trainload of cars including over 100 automobiles. The cars will be distributed by the company through this district. As this is the first train of automobiles to be ordered for this territory the announcement is looked upon as a decided indication of improved business conditions.

Accessibility Features Wisconsin Line



Save Sectional Views

They are of great value when it becomes necessary to tear down and reassemble an engine. These sectional views are to the mechanic what a blue print is to the engineer



These two sectional views of the model Wisconsin engine illustrate the oiling system. Note the oil pump in the base, surrounded by a fine mesh screen. The tube going from the crankpin to the piston also is shown

IN bringing out its line of engines for 1921 the Wisconsin Motor Manufacturing Co. has kept the question of maintenance and service ability in mind. While the engines are made in nine different models, there is much in the way of accessibility that applies to all. We find, for example, the same method of adjusting the fan, removing the lower half of the crankcase, oil pump construction, etc.

Exteriorly, the engines present a very clean appearance and the designs are so carried out that it is very easy to get at such parts as the carbureter, magneto, water pump, gear case cover, starting motor and generator. Plenty of space has been provided between the magneto, water pump and gear case housing so that a mechanic would have no difficulty in removing such parts as the water pump or removing the glands

Ease of Maintenance Considered in Design—Made in Nine Different Models

for renewing the packing in the stuffing boxes. All the magnetos are mounted in such a way that they can be removed by merely loosening the bolts in the coupling and the central strap holding down the magneto to the base.

This makes it infinitely more easy to remove the magneto than where the instrument is held down by four set screws in the base. All valves are reached for adjustment by removing the valve covers on the side of the engine. On some of the models, especially the R-A-U, the V-A-U and the T-A-U, the valves are accessible because there is nothing to interfere with the movements of a mechanic other than the carbureter which is hung at a central point.

SUITABLE FOR ALL WORK

All of the Wisconsin engines for 1921 are of the L-head type with the exception of the 5¾ by 7, four and six cylinder engines which are of the T-head type. The various models and sizes of engines made by this concern are shown in the table. The L-head engines are of the unit power plant type with enclosed flywheels while the two larger models have exposed flywheels. All of the engines are built with steel or malleable iron supporting arms and provisions are made for mounting starting motors and generators. All of the crankcases except that on the large six cylinder model are of aluminum. The six cylinder engine is built with a bronze crankcase for additional strength deemed necessary on account of the heavy duty required of this engine and the great power developed. Cooling of the engines is by centrifugal pump and one of the features of these engines is the large water jacket space.

Wisconsin engines are suitable not only for automobiles, trucks and tractors but for many other purposes as well, such as driving portable generators, centrifugal pumps, air compressors, swing and bascule bridges, etc. The larger engines also have been used extensively in fire apparatus and pumping engines in which they have attained an enviable reputation. The two larger engines of the T-head type have shown excellent results on account of the thorough cooling of the large valves, simplicity and accessibility of design and efficient scavenging of the large combustion chambers. The fresh gases enter on one side and the burnt gases are expelled on the opposite side.

Special attention has been given economical performance of these engines. The shape and volume of the

combustion chamber, the design of manifolds, valves and valve parts, cams and priming have been carefully worked out so that results are very gratifying. The maximum thermal efficiency of this engine is nearly 25 per cent. The fuel consumption mean effective pressure and thermal efficiency curves all are in respect to the net brake horsepower.

The cylinders on all Wisconsin engines are cast iron and very thoroughly water jacketed. All valve seats are entirely surrounded by water to insure uniform cooling and prevent warping of the valves, or the valve seats.

The pistons are made of cast gray iron, sand blasted, rough machined, heat treated and then finished machined and ground. The pistons for the 5¾ by 7, 4 and 6 cylinder engines carry four rings while the smaller models carry three. All of the rings are carried above the piston pins, but the lower ring of the set is provided with an oil return groove which carries all excess oil back through small holes drilled in the bottom of the ring groove. This gives greater lubricating oil economy and prevents rapid carbon formation due to the oil working up past the pistons. The piston pins are machined from 20 per cent carbon steel, bored for lightness and then carbonized hardened and ground.

PISTONS CAREFULLY BALANCED

On the 3¾ by 5 and 4 by 5 engines two-bolt connecting rod caps are used and on all larger engines a four-bolt cap is used. Crankshafts and flywheels are carefully balanced and the pistons and connecting rods are matched up to within ¼ of an ounce in weight.

All camshafts are removable from the front end of the engine after the gear cover has been removed. The push rods are of the mushroom type, on all engines up to and including the 4½ by 6. On the larger size engines roller type push rods are used. Push rods and guides are easily removed inasmuch as the assemblies are held in place by crabs. The push rods and valve stems are protected by cover plates. The inlet and exhaust valves are interchangeable. The lower spring seat is attached to the valve stem by means of a split taper bushing seating in a groove turned in the valve stem.

One of the features of the Wisconsin engines is the care given to finishing such details as the pump shafts and other accessory drive shafts. These are machined just as carefully as crankshaft and camshafts and are finished by grinding. In addition such parts as the cylinders, crankcases, connecting rods, pistons and gears are sand blasted to remove all sand and scale after which the parts are machined and washed in a hot solution to remove all chips and dirt. To insure correctness in alignment the crankcases are bored for the crankshaft, camshaft, idler and pump shaft bearings in a fixture, the bearings then are inserted and the crankcases are again put into the fixture for boring and reaming the bushings so that the gear centers will be held within close limits and the shafts parallel.

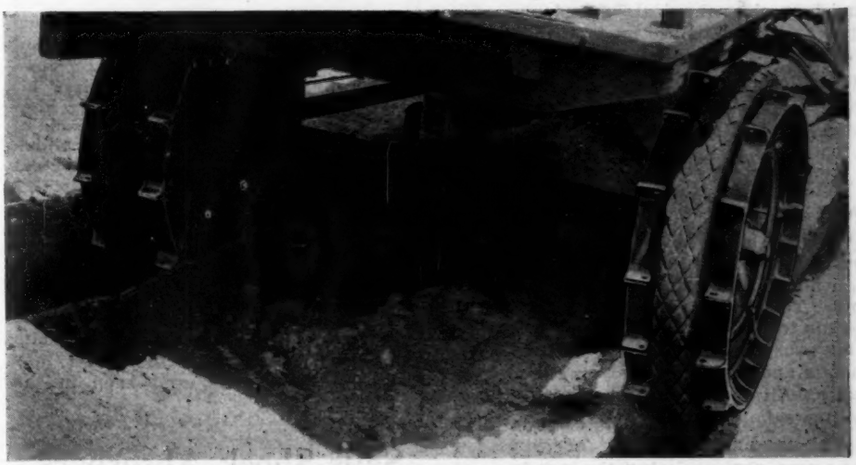
Table showing models, cylinders and sizes of 1921 Wisconsin engines.

Model	Cylinder	Size
CAU	4	3¾ by 5
EAU	4	4 by 5
TAU	4	4 by 6
UAU	4	4¼ by 6
VAU	4	4½ by 6
RAU	4	4¾ by 6
RBU	4	5 by 6
M	4	3¾ by 7
P	6	5¾ by 7

Much of the efficient operation and performance of the Wisconsin engine is due to the lubricating system. This is of the force feed type in which the oil is drawn up by a pump from the lowest part of the base and forced through a steel oil duct or main header to the main bearings and through the drilled crankshaft to the connecting rod bearings. The oil that is thrown off the connecting rods lubricates the pistons and the camshafts. The camshaft bearings are provided with small cups where the oil collects and runs to the bearing surfaces. The main bearings are fitted with oil grooves which distribute the oil over the bearing surfaces. They also supply the passage for oil to the connecting rod bearings through the drilled holes in the crankshaft.

From the main oil duct a small opening sprays oil to the gears which in turn distributes the oil over all the wearing surfaces in the gear housing. The bottom of the crankcase is so built that the oil drains back into the sump. Before the oil can get back into the pump it is strained through a fine wire mesh surrounding the pump. The oil pump may be removed by removing three nuts, the pump being held in place by three studs, but is not disturbed when removing the lower half of the crankcase. The pressure on the oiling system is regulated by a spring operated plunger, and is set to register 12 to 15 lb. when the engine leaves the factory. Easy access to the oil strainer is obtained by taking off a plate bolted to the bottom of the crankcase. This plate holds the strainer up against the flange cast around the oil pump column. A felt washer forms the joint between the strainer and flange. An oil gage extending through the upper case indicates the oil level. The following list will give the amount of oil required to bring the gage to the high level mark:

Types	Size	Oil Capacity
CAU	3¾ in. by 5 in.	5 qt.
EAU	4 in. by 5 in.	5 qt.
TAU	4 in. by 6 in.	8 qt.
UAU	4¼ in. by 6 in.	8 qt.
VAU	4½ in. by 6 in.	8 qt.
RAU	4¾ in. by 6 in.	12 qt.
RBU	5 in. by 6 in.	12 qt.



The Foley Traction Rim

ONE of the devices now on the market that is destined to further the use of trucks in districts where good roads do not abound is the Foley traction rim. This is an auxiliary or extension rim to be fastened to the felloe of a truck wheel and can be used either with solid or pneumatic tires. The extension bearing surface is provided with traction cleats in order that a firm grip might be obtained on the road surface. Provision is made for the expansion of tires. Where the going is extremely bad a truck can be equipped with two rims and a double set of non-skid chains. On the Ford pneumatic tired truck the Foley rims are held in place with 7/16 by 7 in. carriage bolts. A special rim is made for the Nash quad.

In applying the rims use is made of the S. A. E. solid tire scale measurements. For example: a Foley rim 34 by 3¼ fits a truck wheel having a 34 in. tire. Rims for the pressed-on type of wheel are available in the following sizes: 32-in. 12 spoke, 34-in. 12 spoke, 34-in. 14 spoke, 36-in. 12 spoke, 36-in. 14 spoke, 40-in. (3½ ton) 14 spoke, 40-in. (5 ton) 14 spoke, Nash quad disk wheels and Duplex four wheel drive (heavy type). The 36-in. rims are made to fit any style or make of truck wheel regardless of the number of spokes. For pneumatic tires the rims are made for wheels using the following tire sizes: 32-in., 33-in., 34-in., 35-in., 36-in.

Foley rims are made by the Foley Traction Rim Co., Minneapolis, Minn.

A Department of BETTER BUSINESS

A dollar will be paid for all ideas accepted as Better Business—Perhaps you have some.

Conducted by Ray W. Sherman

High Pressure Room Aid to Sales Work

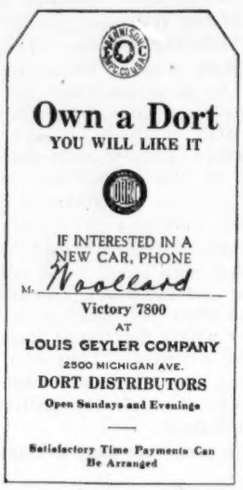
A dealer at Marshalltown, Iowa, believes in a separate room for sales work and keeps a room especially for that purpose. Salesmen may bring in their prospects, and talk without any danger of being interrupted. All literature, pertaining to the lines he carries, is kept in this room. When a prospect brings up the subject, the salesman explains that all of their literature is kept in that room, invites the prospect in, closes the door and talks business. If the salesman needs the aid of the dealer himself to make the sale, he can press a button which is concealed under the ledge of the desk and which leads to a bell in the dealer's office. This is a signal for the dealer himself to appear on the scene and help close the deal. The dealer says that additional sales made through the medium of his "high-pressure" room pays its rental many times over.

Analyze Selling Points for Advertisements

What points make the most sales for you? Is it price? Is it mileage? Is it reputation? Analyze your sales, pick out the strongest selling points and then tell about these points in your advertising. Tell just how you presented these points to various prospects and just what the prospects said in answer to your points and tell just how you closed your sales. All of this would have a localized, intimate touch which would make interesting reading matter for every person who was contemplating the purchase of a car and all this would also help you to get things lined up in your mind to the very best advantage.

How Some Dealers Meet the Tire Demand

Many motorists are driving without spare tires this spring. Regardless of the fact that their tires are apt to give trouble during the first hot days, financial difficulties are overruling their desire for a spare tire and they are taking a chance. Some dealers are cashing in on this situation in rather novel ways. Most of them are pushing sales of used tires and tubes for extras. One dealer cleaning up his stock took in a number of used tires on new ones to meet his demand. Another took the tires off his used cars and fitted them out with new tires as he sold them. Another dealer bought tires from a junk dealer and fixed them up and sold them at a nice profit. In this way they furnish the user with a tire that will bring him home in case of an accident and they clean up their stock and keep in the habit of selling.



One Chicago salesman is going after business by tagging all the cars in Grant Park, which is the central parking ground for the business district. He gives his name on the tag, thus introducing himself to the car owner. On the back of the tag are the city's traffic rules, which are so important that he will be very apt to keep the salesman's card containing them with him at all times

Sells Shock Absorbers by Demonstration

A dealer handling a popular car has been successful in equipping many of the cars he sells with shock absorbers. He has a novel way of demonstrating that shock absorbers actually do make a car ride much easier. Near his place of business is a steep hill, which has a reputation for its continual roughness and poor condition. He keeps two cars for purposes of demonstration, one equipped with the shock absorbers he handles, and one without. First he takes his prospective customer down the hill in the car that is not equipped then demonstrates the comfort of the car equipped by taking the prospect down the same hill in the car he has equipped for that purpose. The comparison in the riding qualities of the two cars makes him many sales.

Getting City Business During the Rush

During the summer months there is, of course, a tremendous increase in the car washing business. In the majority of cities the car washing garages in the business district of the city are rushed to death. This being the case, some of the outlying garages might get some splendid advertising and also do some good business by renting a vacant lot near the center of town for the summer months and putting up a tent on this lot in which cars could be washed by the concern. A big sign on the tent might advertise that the garage was always looking for new ways to serve and that this was its latest method of giving added service all of which would create attention, get a lot of publicity for the garage and also bring in some profit.

A Sign in Short-Hand As Attention Getter

Something entirely novel in the way of a window display will secure much attention for the dealer every now and then. For instance, if the dealer should have a stenographer write out this sentence in short hand, "USED CARS AT PRICES WITHIN THE REACH OF ALL." If the dealer then had a sign painter reproduce this short hand sentence in large size characters placed the sign in the main show window, the affair would attract a tremendous amount of attention. All the stenographers in town would be pretty sure to talk about the show room and this would make folks think of the dealer when thinking of buying used cars. And all of this should boost the dealer's sales of used cars materially.

Go After the Five-Year-Old Owners

It is estimated that the average life of the automobile is about five years. That means that the car that was bought five years ago is ready to be replaced. Why not find out where that five year old car is and go around and see the owner? Maybe it's the original owner; more likely not. But the registration system will help you. Look over the state list of owners in 1916 and see if you can't interest some of them in new cars.

A Street Parade as Business Stimulant

In order to stimulate business in the city of Scranton, Pa., a number of motor car dealers recently got together and launched a parade that promoted considerable interest. Each dealer contributed as many new cars of different styles as possible, that is, roadsters, touring cars, enclosed cars and sport models. Heading the procession came a large sign reading, "Hard Times Are Over." Many of the cars were draped and each dealer had a slogan. The procession of new cars was followed by as many used cars as each dealer had on hand and on each was its sales price. Such a parade should occur on a holiday, Saturday afternoon or some time when it is likely to be most appreciated.—C. A. Roden, Scranton.

Selling Motormeter in Lieu of Repairs

Realizing that the average car owner dislikes repair bills, one dealer boosted his motormeters sale by showing that a motormeter is a prevention for repair work. He secured a cylinder that had been ruined by overheating, sawed it through lengthwise and placed it on display. The card underneath the cylinder gave the following information: THIS CYLINDER WAS RUINED BY THE ENGINE OVERHEATING. THE REPAIRS COST $65. IT COULD HAVE BEEN PREVENTED IF THE OWNER HAD EQUIPPED HIS CAR WITH AN INEXPENSIVE MOTORMETER. The display taught a lesson to car owners that they did not forget.

Brings the Coast Nearer by Airplane Mail

The Fryac Mfg. Co., Rockford, Ill., maker of Fryac spark plugs, has brought its San Francisco branch office a day nearer to the factory by making use of airplane mail. All envelopes used by the company in corresponding with this branch now bear the printed inscription "via airplane mail from Maywood, Illinois." By airplane from Maywood (just outside Chicago) to the coast, city stops are made at Omaha and Ogden, only two relays being necessary in the flight which takes the mail two-thirds of the way across the continent. The experience of the company is worth consideration by other firms in the automotive industry who maintain connections on the Pacific coast.

Beams of Light That Led to Business

An effective way of advertising spotlights was evolved by an Indiana dealer. This dealer trained lights from his store window so that they would shine on the street in front of his store at night. Then when the motorists came by, looking at the street in front of them as they always do, they noticed these beams of light across the street and wondered what caused them. This made the motorists follow up the beams of light to the dealer's store, where they saw the spotlights and also saw a brightly illumined sign advertising the lights. This stunt secured a considerable amount of business.

Accessory Dealer and Sales of Springs

A plan to effectually promote the sale of replacement springs was recently worked out by a dealer in accessories. The particular make of replacement spring sold by him was guaranteed against center breakage. An old spring, which had been broken at that point, and a replacement spring of the same size were placed on a display rack in the salesroom. A sign underneath read: WE EQUIP CARS WITH ———— REPLACEMENT SPRINGS. GUARANTEED AGAINST BREAKAGE SUCH AS THIS. The dealer had no trouble in replacing broken springs with the replacement springs.

Car Theft Victims As Prospects

EVERY man who has a car stolen is in the market for another car in practically all instances where the car is not returned. Nowadays when the thefts of cars are so numerous it would be worth while for any dealer to watch the papers closely for notices of thefts and then get in touch with the victims. In all probability a number of sales could be made in this way, if not immediately, at least in sixty days when the insurance on the stolen car is paid.

Tells Customers How His Products Turn Out

Several radiators can be repaired by removing a section and replacing it with a new section. A customer who had bought such a radiator from a dealer got too close to a load of wood and ran a pole through his radiator. The dealer took a picture of the radiator before and after the repair and sent out literature describing the accident and the small cost and short time required in repairing. This literature went to every Ford owner in his territory, and netted him several direct sales and got considerable publicity that will no doubt bring in future business.

Get the School Students Interested

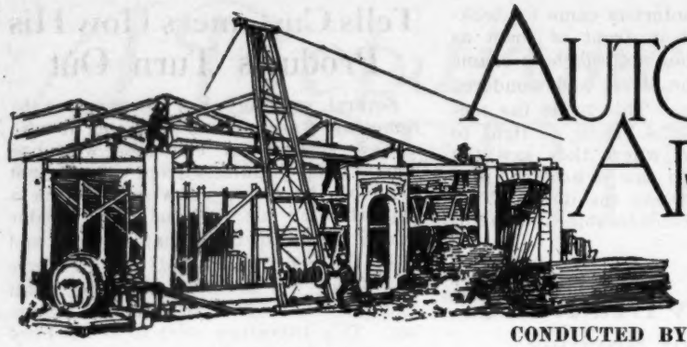
A Missouri dealer offered a $10 prize to the high school student that wrote the best paper describing a ride in his car. Of course, he had to give them a ride, but it did not take long, and many of them had parents who were in the market or had some influence on a friend. The contest was very popular and the news connected with it paid for the trouble several times. When nearly the whole school got busy telling how nice a certain car rode and were having their papers read and criticized, most everyone soon became familiar with the riding qualities of the car.

Carry Crowds — They Will Help You Get Business

Get your service truck out—if it has an emphatic sign on it so much the better—and carry crowds to the ball game. Make a nominal charge if you wish but get as many people as you can to ride under your banner. This is not restricted to ball games. Go to any gathering where people go. Haul the Boy Scouts to camp and home again. Use your demonstrator truck if you have one. This brings dollars worth of business to your shop for the visitor who is looking for service, tires or oil is asking someone where to go and if the informant rode with you that day or some previous day he will naturally refer him to your place.—E. H. Birdsall, Madrid, Iowa.

Giving a Personal Touch in Starting Business

When Centlivre Bros., Fort Wayne, Ind., embarked in the tire and repair business they used a different sort of advertisement from the kind customarily used in announcing the start of a business of this sort. These young men had an advertisement prepared to look like a feature story in a newspaper. The art work was just like the art work seen in newspaper feature stories and includes photos of the two brothers and of their place of business. Then the copy for the ad was a readable story telling about how the boys had been in the army, how they picked the location of their shop because that section of the city wasn't served by a repair shop and went on to tell how they are known as "Looie" and "Frank" and how they wanted all their customers to call them by these names. Of course the advertisement was widely read and gave them a splendid start.



AUTOMOTIVE ARCHITECTURE

Planning and Building Problems

CONDUCTED BY TOM WILDER

Building With Hollow Tile

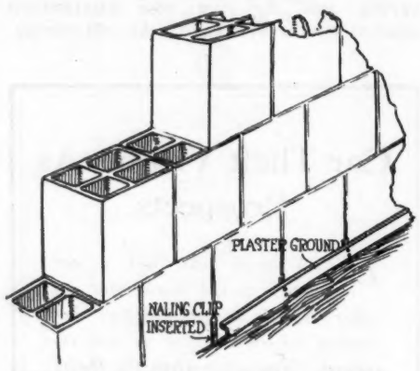
Concluded from last week

HOLLOW tile is strictly a modern building material as far as its design and construction is concerned. Used in the olden times it would not have stood the test of carrying heavy superstructures through shear weight and bulk of material as brick and stone have done but in our modern types of buildings it is just the thing, being very light and rigid. It is not suitable for solid self-supporting walls of more than two stories and is much more serviceable for partitions and for filling in on concrete and steel skeleton structures. It is designed to take advantage of the principal that for a given sectional area the farther the material is from the center within practical limits, the more it will support. Thus an 8 in. by 12 in. tile having ⅝ in. walls and one division each way will have a total sectional area of 33½ sq. in., or slightly more than one third of 96 sq. in., the area of the block. The 33½ sq. in. of actual area is practically the same as the area of one common brick.

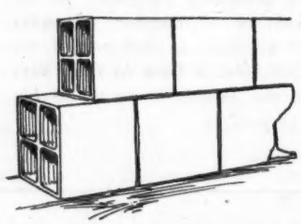
End on End for Strength

No one would consider making a column of a tile of common brick placed flat one above the other yet a very satisfactory column may be constructed of 8 in. by 12 in. hollow tile whose actual sectional area is the same as the brick. When hollow tile is built into a continuous wall where maximum strength and rigidity is desired, the blocks should be placed on end. This would seem wrong to the layman because of the narrow bearing surfaces but there are two very good reasons for so placing them. When on end the supporting area is the total sectional area of the block while in the lying down position the horizontal surfaces merely act as ties to join the outside surfaces and as bearings between tiles, and carry no load whatever.

The tile is also actually stronger in the vertical position because of the longitudinal grain in its structure caused by the flowing of the clay through the forming dies. Like every other material, hollow tile has some disadvantages, probably the worst of which is that it cannot be cut or broken readily into smaller sizes. On account of the grain running in a longitudinal direction, it breaks very easily this way and if the greatest care is not exercised in cutting it crosswise, the whole piece will be shattered. For this reason, where there are many corners and complicated turns, it is well to allow quite a little for waste and breakage when figuring the amount of material necessary. Masons sometimes use common brick to fill in small places where it is difficult to fit in cut pieces of tile.



This is the best way to lay a hollow tile wall. The partitions and tile walls are all vertical and consequently all aid in the support of the weight of the wall



Tile in the horizontal position is much easier to lay but makes an inferior wall because it has only a little over half the cross sectional bearing surface that it should have

Another disadvantage is that the tile often contains soluble salts which effervesce or come to the surface with moisture which drys out leaving fine crystals which are injurious to plaster and especially to decorations on the plaster. The best way to combat or prevent this is to make the brown plaster coat of cement with very little or no lime. This is practically waterproof and very little moisture will ever get through. Another bad feature is that it is very difficult to nail interior trim to a tile wall, the nails come out easier than they go in. About the only way is to put wood plugs in the joints and nail to them.

Where hollow tile is used the superintendent must look ahead and plan ways to fasten the trim on so that when the time comes it can be done easily. The nailing places must be marked on the plaster in some way, otherwise when covered up they cannot be found. There are sheet iron clips or pockets made which a mason can insert in joints between the blocks if given proper instructions. These will take the nails holding the plastering grounds which in turn will hold the trim. Where tile is to carry a heavy concentrated load as at truss bearings, etc., the blocks should be reinforced by filling with concrete.

Time Saved in Laying

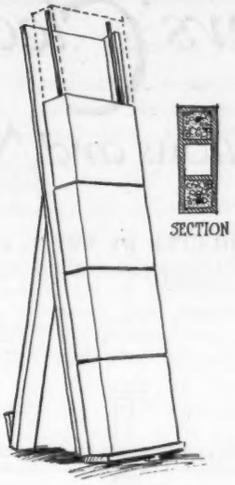
In the case of columns built up of hollow blocks, one, two, or all the sections may be filled according to the weight to be carried and a steel rod inserted as described in making lintels. Hollow tile can be layed three or four times as fast as brick and men used to handling them can do the work faster than the superintendent can lay it out. This is especially true of long garage walls and partitions where the maximum speed can be maintained and a great saving in labor made. Another advantage besides speed in laying is low conductivity of heat and cold though this is not so low as usually claimed. Probably the biggest advantage is the saving in ferring and lath. A wonderful job of plastering can be done directly on the tile, while in the case of brick and stone, ferring strips must be nailed on with lath on the strips before the plaster can be put on. Lightness is also a feature when it is being carried up several stories. Figs. 1 and 2 show the right and wrong ways to lay hollow tile in a wall.

If they are not too long and consequently too heavy to handle lintels and short beams may be made as shown in Fig. 3 by building up several blocks with the upper and lower openings filled with concrete, a steel rod being placed about ½ in. from the outside wall. These tiers of blocks cannot be filled

all at once because of displacing the rods, but one at a time is lowered over the ends and filled after the first is in place and filled. When several are to be made they may be built up one against the other using care, of course, to keep them all straight and true.

Sometimes the blocks are warped slightly and it will be necessary to insert small wedges between them to make them stand straight and line up properly. Never try to move the lintels until they have hardened thoroughly. If the cement is rich and the weather warm, twenty-four hours will do. Carry them edgewise always and if they are piled away for use later support them on strips of wood placed at about one-fourth of their length from the ends.

NOTE—From time to time it will be the purpose of this department to publish descriptions of the various building materials and processes employed in garage and service building construction. If any readers wish to ask questions along this line they will be cheerfully answered where possible.



Lintel of hollow tile up to 7 or 8 ft. long may be made by filling the openings with concrete reinforced with two steel rods

How the Electric System Works—Part III

Concluded from page 15

considered as elastic bands, and that they try to straighten out, we can see that this tendency acts to force the right hand side of the coil downward and the left hand side upward, thus causing the coil to turn or rotate on its pivots.

In a meter, this tendency of the coil to turn when it carries a current is opposed by the action of a delicate spiral spring like the balance wheel spring in a watch, so that the coil only turns through a slight angle, until the tension in the spring equals the torque due to the magnetism, and the coil then comes to rest. Further increase in the current will move the coil farther and if the current stops the spring returns the coil to its original or zero position.

In Fig. 5 is shown the working principle of a meter, a needle fastened to the coil, and turning with it to indicate the readings of the meter. As the moving element of the meter is wound on an aluminum frame and is made as light as possible, small wire is used. It is not expedient therefore to try to run heavy current through a meter of this kind, and as shown, the instrument is suitable for use as a millivoltmeter, as about .1 volt or 100 millivolts would be required to turn the coil for a full scale deflection. (A millivolt equals one one-thousandth of a volt.)

We will assume that this meter movement has a resistance of 10 ohms, that it requires 100 millivolts for full scale deflection, and that the current going through the moving coil is, therefore, .1 volt divided by 10 ohms or .01 amp. We will now consider what changes are necessary to make an ammeter out of this instrument.

The construction and use of an ammeter is indicated in Fig. 6, and it will be observed that inside the meter we have connected to the terminals not only the small wires that go to the moving coil but also a heavy metal strap going from one terminal to the other. This connection or strap is called a shunt, and is used to carry most of the current which goes through the meter.

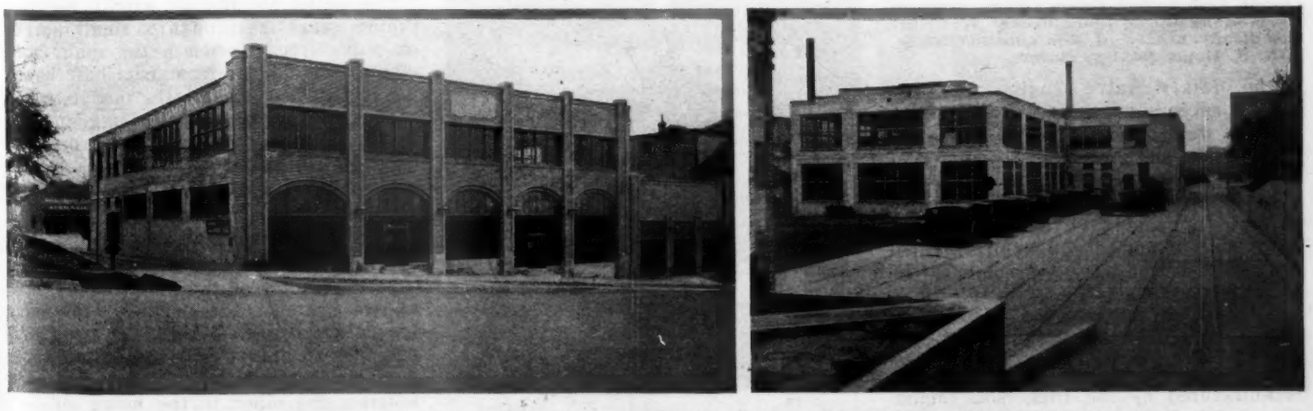
Let us now see what the nature of this shunt will be so as to make a 6 amp. meter out of one that without the shunt was a 100 millivolt meter. We know that 6 amp. going through the shunt and the coil must produce 100 millivolt drop, or looking at it another way, out of the 6 amp. that go through the meter, only .01 amp. must go through the coil, so that 5.99 amp. must travel through the shunt. The resistance of the shunt must, therefore, be .1 volt divided by 5.99 amp. or .0167 amp.

To consider the ammeter in a general way without bothering to figure the exact resistances, we can remember that in parallel circuits, the current divides, in proportion to the carrying ability of the branches of the circuit, so that then if a very large shunt is used it will carry most of the current, only a faint current is used in the coil, just enough to operate the needle. This does not affect the accuracy of the instrument, however, for the current in the moving coil is always proportional to the total current. In Fig. 6 the ammeter is shown reading 2.5 amp., the amount of current used by one 21 candle power bulb as used in a head lamp.

When we come to the voltmeter shown in Fig. 7, we find that a fine winding inside the meter is used to limit the current that flows in the moving coil, it being connected in series with this coil. Let us now assume that the maximum voltage we wish to read for full scale deflection is 12 volts, and that it still requires but .01 amp. through the winding to give us this full scale deflection. The total resistance necessary is, therefore, 12 volts divided by .01 amp. or 1200 ohms, and as the moving element already has a resistance of 10 ohms, the extra series resistance must supply the difference or 1190 ohms.

As in the case of ammeters it is only necessary to get the general idea of the voltmeter's design to be able to use it intelligently, and since it has a very high resistance, we can see why it is perfectly safe to connect it directly to the battery. In the case of the ammeter, however, connection should **never** be made directly to the storage battery, but there should always be a protecting resistance in series with it, such as a coil, or lamp as in Fig. 6, as an **ammeter will burn** up if connected directly to a battery.

Part IV next week



The new home of Randall-Dodd Auto Co., Salt Lake City, Buick and G. M. C. distributors, which has just been completed at a cost of $225,000 presents another monument to the faith and stability of the automotive industry in the Inter-mountain territory. Note the service yard with its concrete floor

The Readers' Clearing House

Questions and Answers

CONDUCTED BY ROY E. BERG
Technical Editor, Motor Age

Overland Oiling System

Q—Has the overhead valve system ever been used successfully on air cooled engines? If not, why not?

2—Explain the oiling system of an old model four-cylinder Overland which has individual cast cylinders and uses a mechanical oiler of the multiple plunger type. How much oil should be carried in the crankcase?—Louis H. Cobet, Poplar Bluff, Mo.

1—Franklin, Holmes and Cameron use the overhead valve type of construction and it has also been employed successfully in the design of aviation engines.

2—The operation of the lubrication of the older model Overland engine is partly by splash and partly mechanical. Crankshaft bearings and connecting rod bearings are lubricated with oil splashed by the lower ends of the connecting rods dipping into the oil contained in the crankcase. Cylinder lubrication is secured by means of oil forced between each cylinder and piston set from a mechanical lubricator, shown in Fig. I. To increase the quantity of oil forced from each cylinder to the gears, or to the crankcase, it is only necessary to loosen the lock nut, screw the adjusting nut up or outward which allows the yoke to move the plunger lower into the cylinder, thereby forcing a greater quantity of oil past the check plunger and into the feed tooth leading to the engine. To decrease the quantity of oil, screw the adjusting nut down. If a cogging of the feed tooth should occur it will be indicated by the plunger or plungers remaining up. The obstruction can usually be removed by working the plunger up and down by hand.

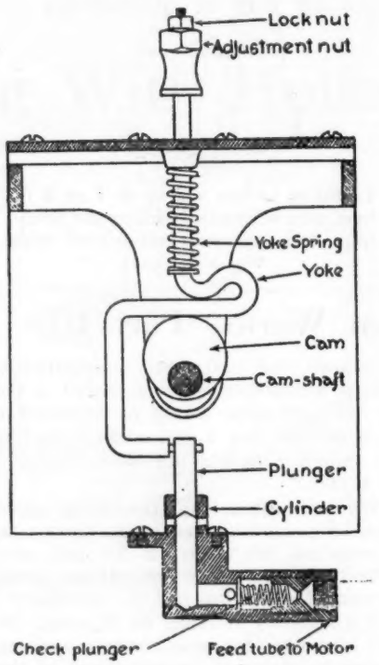


Fig. 1—Sectional view of the mechanical lubricator on an old model Overland engine

ROTARY VALVE ENGINE.

Has there ever been a successful engine with rotary valves in the shape of tubes along the cylinder heads? What are the disadvantages of this construction?—Eric S. Hope, Dexter, Maine.

The rotary valve engine has not been a success up to the present time. A great deal of experimental work has been done and a number of different types of rotary valve engines have been built but they have not been perfected so as to compete with the poppet valve type. One of the chief difficulties which has not been entirely overcome is the inability to properly lubricate the tubes. The result is that the tube heats and warps and in a short time wears badly.

Fig. 2 shows a rotary valve engine manufactured by the Dickerson Engine Co. of Salt Lake City, Utah, which has tubular valve mechanism located along the cylinder head. This engine was placed under test at the Armour Institute of Technology at Chicago and made a very creditable performance. The engine was allowed to run for twenty minutes under full load without any lubrication for the valve mechanism and there was no decided drop in readings on the dynamometer. There was no tendency to continue to heat as the cooling water ran up to a maximum temperature of about 180 deg. and remained practically constant.

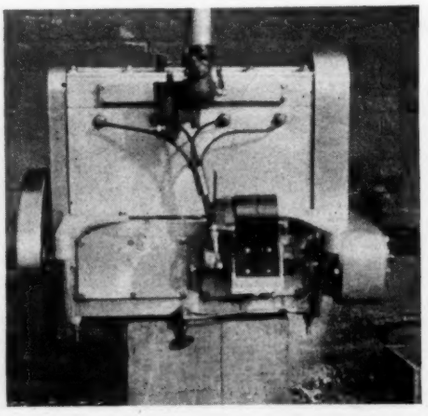


Fig. 2—Rotary valve engine which has tubular valve mechanism located along the cylinder head

MARMON OILING SYSTEM

Q—Publish diagram of oiling system on a 1912 Marmon, Model 32.—Evan D. Young, Saunemin, Ill.

Diagram of oiling system on 1912 Marmon is shown in Fig. 3.

GRANT OILING SYSTEM

Q—Publish power curve of the new engine being used in the Grant Six.

2—How does this new engine differ in design and power from the Falls engine previously used?

3—How are the rocker arms of the overhead valve mechanism lubricated?—H. S., Seattle, Wash.

1—A power curve of the Walker type engine used in the new Grant is not available at this time. The piston displacement in 198.9 cu. in. and the S. A. E. rating is 22.5 hp. The engine develops about 40 hp. at 2300 r.p.m.

2—The Walker type engine is slightly smaller than the Falls engine and is rated at about 1 hp. less. The valve mechanism is entirely different and is provided with a forced system of lubrication.

3—Oil is drawn into the pump and by positive gear action forced upward to a main supply line made of copper tubing attached to the left side of the crankcase (inside). This main tube runs to the front end of the crankcase 3¼ in. above the center line of the crankshaft. The front end of the main line is curved inside the gear case and connected by an elbow to a reservoir in the crankcase casting directly above the front crankshaft bearing. From this reservoir oil is forced to the crankshaft bearing and the timing gears by two separate feeds.

The outlet for the oil supply for the timing gears is through a small screw or plug directly beneath the main line elbow. Oil for the front camshaft bearing is provided through the medium of a pocket or reservoir cast in the gear case above the main bearing. Oil from the gears is thrown into this pocket and drains into the bearing.

The crank and camshaft rear bearings receive oil under pressure through the cored holes in the crankcase.

In the center of the main supply line is a tee which is attached to a web cast in the crankcase. There are two cord passages in this web, one leading to a point directly over the crankshaft center bearing, the other to the lower side of the camshaft center bushing. Oil is, therefore, carried by pressure to these two bearings and the center camshaft

bushing is grooved so as to allow oil to pass around it and continue on up through a copper tube running to the top of the crankcase. The cylinder head is drilled to allow oil to come to a point just below its upper surface.

At this point two passages are drilled, one leading to No. 3 and the other to No. 4 rocker arm support. These supports are cored to permit oil being forced through them to the front and rear rocker arm shafts. These shafts are hollow and drilled to permit the passage of oil to the rocker arms which in turn are drilled to allow a flow of oil to the tops of the push rod adjusting balls. The oil in the crankcase should not be allowed to drop to less than half full as registered on the gage.

POOR FITTING RINGS

Q—A Velie, model 28 gave trouble with gas in the crankcase. Car has been driven about 6,000 miles. Put on new rings, including one wedgerite ring to each cylinder. This eliminated the flow of gas in the crankcase but the car uses 1 gal. of oil to every 10 gal. of gas. At all levels of oil in the case a small trail of smoke follows the car. Spark plugs never foul from excessive oil. Can you advise trouble and way to remedy same?—A. W. West, Wanette, Okla.

In spite of the fact that the plugs do not foul from the effects of oil pumping, oil must be getting by the rings and passing out through the exhaust. There is a possibility that the rings have been installed up side down. The only suggestion we can offer is that you examine the rings to determine why the oil is getting by.

ENGINE OVERLOADED

Q—Have taken apart a 1920 model Monroe car which knocks when pulling a hill on high and found wrist pin bearings, crankshaft bearings and timing of same O. K. Could the carbureter or compression cause such a knock?—F. Schuerman, Decatur, Ill.

The knock which is present when the car is under heavy load such as pulling up a hill on high is probably a result of driving with the spark too far advanced. If the engine runs smoothly and without a knock under light load the knock can hardly be the result of a too high compression. There is a possibility that the mixture is too rich but this would have a tendency to load up and give rather poor engine performance at all times.

ENGINE LOPES

Q—The engine on an Oldsmobile 8, 1917 Model, lopes when idling. This car has been driven 7,500 miles and is equipped with a Johnson carbureter. This engine runs fine in high, up to 15 m.p.h., then starts to lope. The carburetor has been tried with every conceivable mixture, all having the same effect. However, the engine acts worse when a rich mixture is used. Can you advise what causes it to lope and how to remedy?—F. Farrington, Diboll, Texas.

This loping condition is probably due to a faulty vacuum tank or badly worn valves. Indications are that raw gasoline is being drawn into the manifold which causes loading and consequently irregular running of the engine. A good test to make is to remove the inner vacuum tank leaving only the outer shell. Fill the shell with gasoline and if the engine does not run correctly the fault lies somewhere else besides the vacuum system. If the trouble lies in the vacuum tank it may be caused by a leaky float or perhaps the flapper valve is out of commission.

A leaky float will cause the vacuum valve to remain closed and raw gasoline will be drawn into the manifold. A small particle of dirt getting under the flapper valve might prevent its seating tightly and render the tank inoperative. Sometimes the trouble can be overcome by simply tapping the tank. One way of determining whether the flapper valve is seating correctly is to plug up the air vent and detach the tubing from the bottom of the tank. Start the engine and apply the finger to the opening. If suction is felt continuously, there is a leak in the connection between the tank and the main gasoline supply or the flapper valve is being held off of its seat.

It would be advisable to check the manifold connections to see that they are tight. Examine the valve stems. Very often badly worn valve stems will permit air to enter and cause irregular running and it will be impossible to get smooth operation with any carbureter adjustment.

ONE CYLINDER MISSES

Q—Advise why a 1912 Regal equipped with Michigan magneto and dry cells for starting, does not fire regularly on the second cylinder. All cylinders fire regularly with the exception of the second which does not get a spark at all times. The car will run fine for a short distance and then start to miss. Have changed wire from that plug to magneto with no result.—Ethan Sabin, Watkins, Iowa.

If you are sure that the missing always occurs on No. 2 cylinder indications are that the spark plug is at fault. Remove the plug and clean it thoroughly. Set the gap between the electrodes 1-64 in. Another possible cause for the trouble is a defective valve. The fact that missing does not occur until the engine has run for a short time might indicate that one of the valves does not close when the engine is heated up.

BEARING TROUBLE

Q—Is it possible to get any bronzed babbitt lined bearings to fit a 7 W Continental engine? The connecting rod bearings on an Auburn geared 4.66 are causing some trouble. Have pounded the bearings several times with plenty of oil and good pressure with no result. Will it do any harm to run this engine about 40 m.p.h. for about 20 to 30 miles?—Claude De Jean, Duson, La.

If you are having considerable trouble with the connecting rod bearings and are sure that the bearings are at fault it would be advisable to take the matter up with the manufacturers. We are inclined to believe that the crankshaft is worn and perhaps the lubrication system is not functioning properly. There is no reason why the car cannot be driven at a speed of 40 m.p.h. for 20 miles without loosening up the connecting rod bearings. If new bearings are necessary they should be purchased from the car manufacturer.

The Readers' Clearing House

THIS department is conducted to assist Dealers, Service Stations, Garagemen and their Mechanics in the solution of their repair and service problems.

In addressing this department readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been asked by someone else and these are answered by reference to previous issues. MOTOR AGE reserves the right to answer the query by personal letter or through these columns.

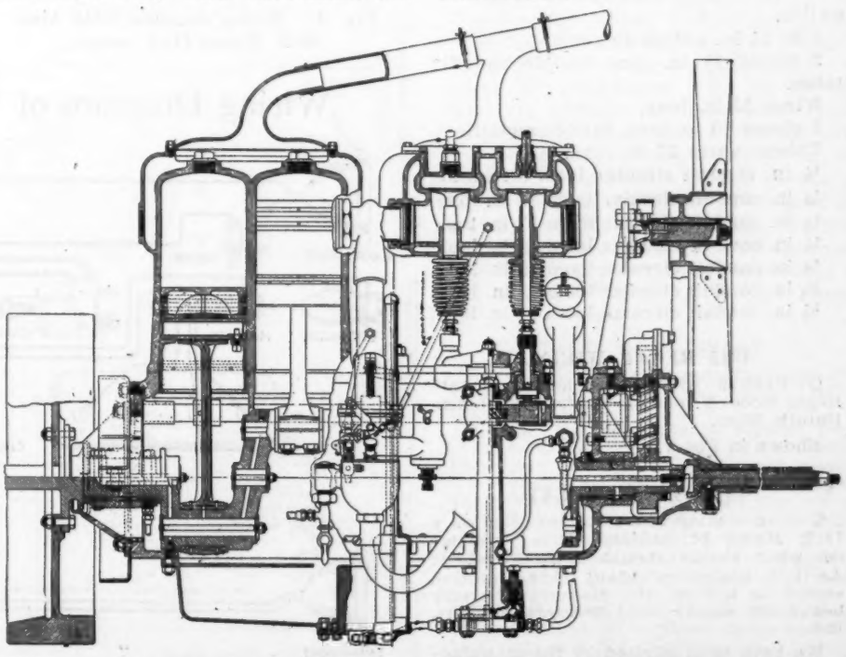


Fig. 3—Sectional view of 1912 Marmon engine showing the oiling system

ELECTRICAL SYSTEMS

CRANKING OPERATION

Q—The ammeter on a 1917 Oakland, Model 34, using Delco electrical system shows a discharge of 20 amp. when the ignition switch is turned on. Explain this.

2—Publish wiring diagram of a 1917 Oakland, Model 34.—V. H. Brazel, Coldwater, Mich.

1—This is not an excessive discharge as it requires considerable current to set the armature in motion. When the ignition switch is turned on an operation known as motoring the generator takes place. The generator is used as a motor to revolve the armature slowly so that the gears will mesh with the flywheel gears when starting. After the armature is set in motion the ammeter reading should be less.

2—The wiring diagram is shown in Fig. 8.

BUICK 31 WIRING

Q—Publish wiring diagram of Buick 31. —Dyke Fick, Hartley, Iowa.

The diagram is shown in Fig. 6.

All wire is No. 12 single conductor—stranded and tinned—cotton wrapped—.025 rubber-cambric tape single braid.

Length of Wire Necessary

Length of red wire is as follows:
12 in. right head lamp to tail lamp.
2 ft. 6 in. conduit to battery.
4 ft. 8 in. conduit to right dash lamp.
1 ft. 0 in. conduit to generator.
0 ft. 10 in. conduit to left side lamp.
Length of green wire is as follows:
9 ft. 6 in. tail lamp to switch.
4 ft. 1 in. between side lamps.
0 ft. 9 in. side lamp line to switch.
7 ft. 10 in. right front lamp to switch.
Length of black wire is as follows:
9 ft. 4 in. battery to ammeter and switch.
5 ft. 11 in. switch to generator.
3 pieces 18 in. long flexible metallic tubes.
Wires 25 in. long.
2 pieces 10 in. long flexible metallic.
Tubes—wires 27 in. long.
¼ in. conduit circular loom 8 ft. long.
¼ in. conduit circular loom 13 in. long.
½ in. conduit circular loom 57 in. long.
½ in. conduit circular loom 79 in. long.
½ in. conduit circular loom 19 in. long.
½ in. conduit circular loom 19 in. long.
⅝ in. conduit circular loom 26 in. long.

1915 REGAL WIRING

Q—Publish wiring diagram of a 1915 Regal Model T touring.—Alfred W. Roden, Duluth, Minn.

Shown in Fig. 7.

INSTALLING RELAY

Q—Can a relay cutout be installed on a 1917, Model 34 Oakland, Delco system? On what circuit should it be installed? As it is, without a cutout, if the ignition switch is left in, the discharge is very heavy (20 amps.).—Dal Trescott, Elkhart, Ind.

We have been advised by the manufacturers of the Delco equipment that it is not advisable to install another relay or any resistance device to prevent discharge when the ignition switch is left on. The only suggestion we can offer is that you take care not to leave the ignition switch on when the car is not in use.

CHANGING FORD VALVES

Q—Will the installation of Fordson tractor valves in a Model T, Ford engine give any more power, speed or flexibility? —B. F. Million, Norman, Okla.

The installation of Fordson valves will increase the speed and power of a Ford engine to some extent. The limiting factor, however, is the manifold. If a high speed job is desired it would be advisable to change the manifold and also lighten all of the reciprocating parts. It is possible to obtain special parts for rebuilding a Ford for racing purposes and better results can be obtained by their use. A rebuilt Ford using parts supplied by the Laurel Motors Corp. of Anderson, Ind., recently made a speed of better than 80 m.p.h. at Daytona, Fla. Special parts can be obtained from the following companies:

Laurel Motors Corp., Anderson, Ind.

Speedway Engineering Corp., Indianapolis, Ind.

Lehman Mfg. Co., Kanelton, Ind.

Paco Mfg. Co., Peoria, Ill.

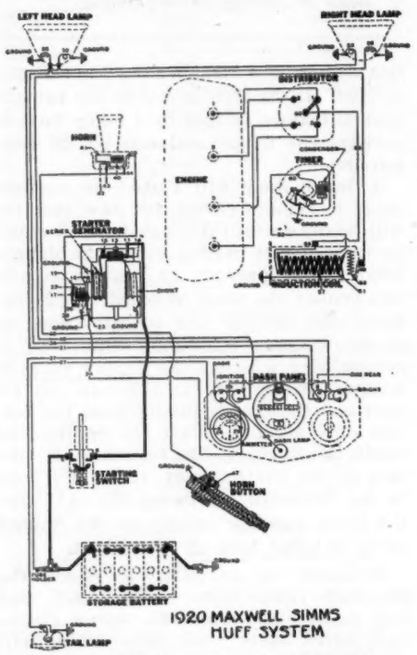


Fig. 4. Wiring diagram 1920 Maxwell, Simms-Huff system

WILLYS-KNIGHT WIRING

Q—Publish wiring diagram of a Model 84-4 Willys-Knight.

2—In replacing new wire what sized wire is required?—John F. Hamilton, Kansas City, Mo.

1—A wiring diagram of the Model 84-4 Willys-Knight is shown in Fig. 5.

2—In putting in new wire No. 12 can be used.

MAXWELL WIRING

Q—Publish wiring diagram of the 1920 Maxwell showing the electrical circuits while this instrument is charging.—N. C. Shafer, Rensselaer, Ind.

1—The wiring diagram of the 1920 Maxwell is shown in Fig. 4.

USING 12 VOLT BATTERY

Q—Can I use a 12 volt Dodge battery on a 1917 Velie, model 28 which is equipped with a 6 volt battery? If so, what changes will I have to make in the wiring?—Mr. D.—Atlantic Oil Prod. Co., Breckenridge, Texas.

It would be possible to use the 12 volt storage battery but it would be necessary to connect two sets of the coils in parallel and an unbalanced condition would result. It would be a better paying proposition to purchase a new six volt storage battery.

Wiring Diagram of Willys-Knight Model 84

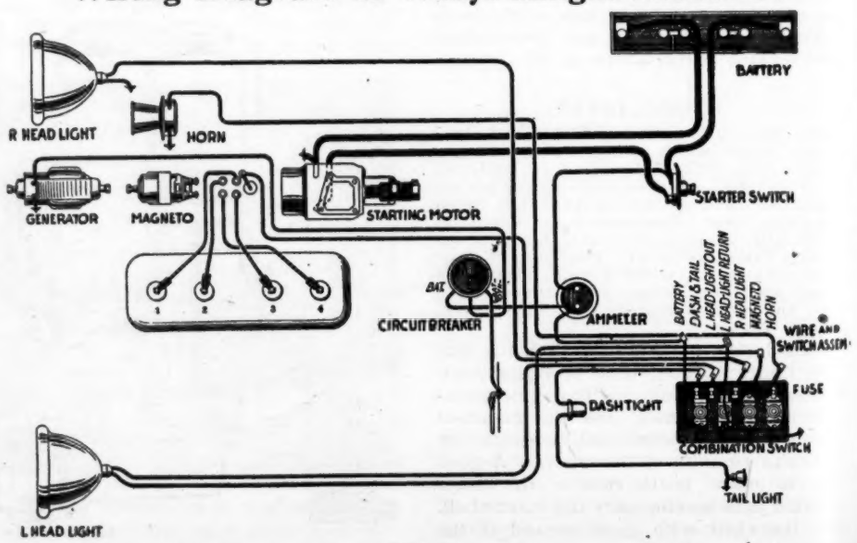


Fig. 5

MISCELLANEOUS

WELDING GEAR TEETH

Q—Explain how to weld cogs in large cast iron gears.—Wm. Haith, Watson, Mo.

In welding cogs in gear wheels or in fact in any autogenous welding operation, it should be remembered that autogeous welding is not welding at all, but casting. In welding, such as performed by the ordinary blacksmith, the metal is merely brought to a paste, whereas in autogenous welding it is brought to a complete fluid condition and the result obtained because of this fluid condition is a casting. In other words, the weld obtained is a casting.

In building up a gear tooth, therefore, the problem is a casting problem. A mold of the proper shape is made and placed on the gear and molten metal added until the tooth is formed.

Before going into this method in greater detail, it should be explained that it is not absolutely necessary to use a mold, the gear tooth instead might be built up by the manipulation of the welding rod and blow torch, in which case, let us assume that the gear tooth was about 3 in. long and ½ in. thick. The welding rod would be added layer by layer until the tooth was fully built up. Naturally the form of this tooth would be very rough and it would require considerable filing or grinding. Consequently, it will prove simpler in many cases to use some sort of a mold. The mold may, of course, be built of ordinary molder's sand, plaster of paris may also be used, and carbon blocks are also frequently employed for work of this kind. The material employed is a graphite material such as is used for crucibles.

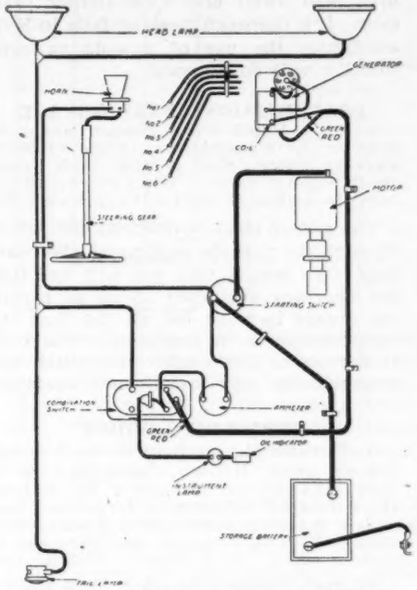


Fig. 8 — Wiring diagram of 1917 Oakland Model 34 using the Delco system

It can be obtained in blocks of any size and shape. Rectangular blocks and round rods of various diameters are stock sizes and can be obtained on short notice from crucible manufacturers. In using this material it will be found advisable to have it in position while preheating.

It is more or less porous and when covered over during the welding the hot air coming from the pores will cause pin holes, as there is no other way for it to escape than through the weld. Preheating the graphite expels some of the air and leaves it less liable to cause trouble, but if a smooth thorough weld is required it will be necessary to turn the piece over, removing the graphite and melting the metal until the blow holes are eliminated. If the graphite block is used it may be hollowed out to the shape of the tooth and clamped in place on the gear, then the gear is pre-heated. It is hardly necessary to add that the usual process in pre-heating the gear applies in this case. After the gear is pre-heated it is removed from the fire and the metal is added to form a tooth.

If no mold is used the metal is built up layer by layer until the tooth is formed. In either case some filing will be required after the shape is finished, although there will be less filing if a mold is employed.

Wiring Diagram of the Buick Thirty-One

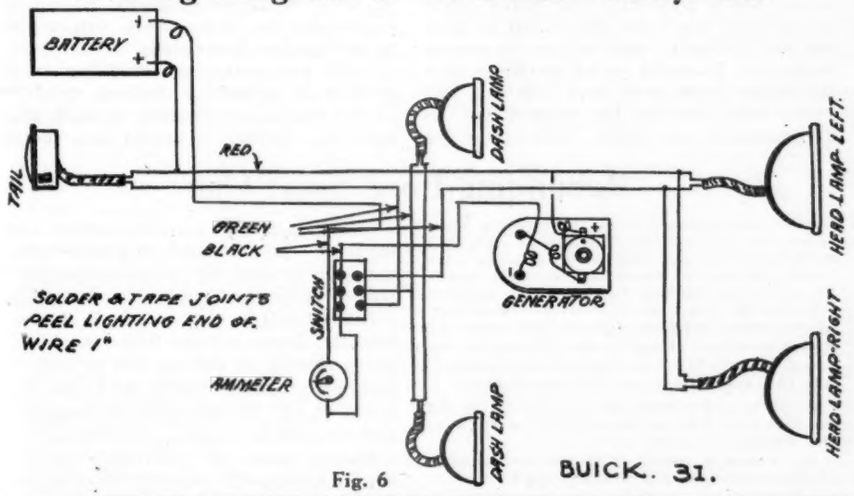


Fig. 6

Wiring of 1915 Regal, Model T, Touring

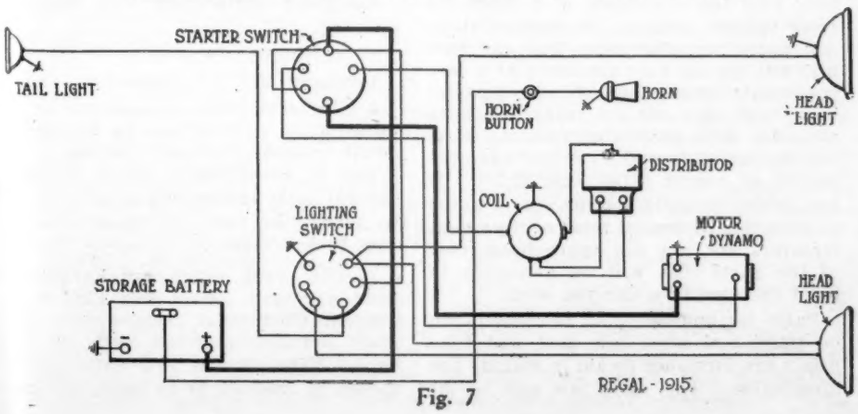


Fig. 7

GETTING MORE SPEED

Q—Advise how to install a Hudson carbureter on an Essex car.

2—By installing a Hudson carbureter and a racing camshaft, what would be the possible speed obtained from a stock Essex, gear ratio 5 1/11 to 1. Is there any other way of getting more speed without changing the gear ratio?—Earl Downs, Chillicothe, Mo.

1 & 2—The general construction of the Hudson and Essex carbureters is the same, and as standard flanges are provided it ought to be a simple matter to make the installation. We do not see why it is necessary to change carbureters as plenty of speed can be obtained with the present equipment. Instead of attempting to tamper with the details of engine construction to get more speed we advise changing the gear ratio. Various gear ratios can be supplied by the manufacturers and it ought to be possible to get at least 75 m.p.h. with the proper ratio.

INCREASING SPEED

Q—What is the best possible speed obtainable with an Essex car with 4 4/13 to 1 gear?

2—Give the approximate highest gear possible to put in an Essex without cutting down the pick up to a great extent.

3—Would it be possible to install another set of spark plugs on this car so as to have double ignition? If so, publish cut of place to install them?

4—Would moving the camshaft gear one tooth ahead give the Essex any more speed?

5—Give information or any adjustments or changes to give Essex more speed.—LaBounty & Riley, Watseka, Ill.

1—With a gear ratio of 4 4-13 to 1 the

car ought to make about 62 or 63 miles per hour.

2—The gear ratio to be used is largely dependent upon the conditions under which the car is to be run. If for dirt track racing a gear ratio of 3 1-2 to 1 will give a speed of about 75 to 80 miles per hour.

3—The addition of another set of spark plugs is not necessary to obtain greater speed and besides the job would be rather difficult. Many of the racing cars in the 183 cu. in. class use but one set of plugs and get very satisfactory results.

4—Moving the timing ahead will give a little more speed but the idling condition will be poor. We do not think it is necessary to do any more than change the gear ratio to obtain all of the speed you desire.

KNOCKS

Q—I have a Ford sedan equipped with a Bosch magneto, special carbuterer and 31 by 4 tires. I cannot increase the speed of the car from 15 to 20 m.p.h. without it knocking very badly. I do not think it can be carburetion as I have adjusted it as lean and as rich as possible without any different results. It does not knock running idle no matter how much I race the motor. Give cause and remedy.

2—There is a whipping action in the front wheels although the nuts and bolts are tight and new bearings and bushings have been installed. Give cause and remedy.—W. H. Kollbaum, Chicago, Ill.

1—It is very difficult to specify the cause of the knock without further details. Following are a few factors that frequently cause engine knocks: Carbon deposit, too much spark advance, loose connecting rod bearings, worn main crankshaft bearings, worn or broken piston rings, pistons striking the cylinder head gasket, loose camshaft bearings, worn valve tappets. To accurately distinguish the different kinds of knocks requires some experience. The so called carbon knock is a clear hollow sound that becomes quite prominent when the throttle is advanced quickly or when the engine is placed under load as when climbing a grade. If the spark is advanced too far it will produce a dull knock. The connecting rod knock sounds like tapping a steel rod with a small hammer and can be readily distinguished if the car is accelerated rapidly and the throttle then closed suddenly. Under this condition the tapping noise will be very distinct.

2—Since new king pins and bushings have been installed and the joints are tight the whipping is probably the result of loose wheel bearings. It would be advisable to check up on the wheel bearings and also see that the tires are properly inflated.

CLOGGED RADIATOR

Q—The radiator in a 1918 Oldsmobile 8, model 45 has a small leak in it. Tried Neverleak which failed to repair the leak so bran was put into the radiator. This remedied the leak, but it also stopped up the circulating system and now the engine won't run for 30 min. without the water steaming. Have put soda in but this doesn't help any. Would you advise installing a new radiator or can this one be repaired?—J. F. Hereford, Hope, Ark.

In a case like this we would suggest that you remove the radiator and turn it upside down. Connect a hose large enough to give a large volume of flow with some pressure and flush the radiator out thoroughly. The use of a hot solution is a waste of time because the bran will swell and stick tighter than ever. If a thorough flushing fails to help conditions the use of a soda or acid solution will do no good.

TRANSMISSION LEAKS GREASE

Q—On a Buick D 45, grease cannot be kept in the transmission. Have replaced gaskets twice, also a new high speed shaft without result. What do you advise doing?—Arthur C. Gravel, Bryn Mawr, Pa.

The grease must be working out either through the gaskets or through the bearings. We believe that you will find that the bearings are worn so as to permit the grease to work out all the time the transmission is in operation. The only remedy is to disassemble the clutch and transmission and install new bearings.

REBUILDING DODGE

Q—Furnish plans for rebuilding a Dodge engine using Hudson Super-Six valves. What changes are necessary for making the valves fit? How much larger are they and is the stem same size as Dodge valve stem? Will this engine use more gas at certain speed?—E. B. Minich, Gillett, Ark.

Several Dodge jobs have been rebuilt using Hudson valves but we cannot say just what speed is possible. The Hudson valve stems are perhaps about .002 smaller than the Dodge valve stems but this is not enough to require any adjustments for a good fit. The valve heads are slightly too large and if left as they are will probably stick when the engine heats up. It would be advisable to turn the heads down more than 1/16 in. The valve seats should be reamed out to accommodate this valve. The stems are about 3/16 in. shorter than the Dodge valve stems and because of the method of holding the spring it will be necessary to cut the stem off a bit and drill a hole in the stem to secure the valve spring. By doing this the valve spring will be compressed about 1¼ in. more than normal. The Dodge connecting rods can be used as they are but it would be advisable to install light gray iron pistons. The engine will use more gasoline because of the increased valve size, but more speed and power will be obtained.

WORN VALVE STEMS

Q—What can be done with a four-cylinder Scripps-Booth, model C that has worn valve stems and guides which are not removable?

2—Does this condition cause the car to be jerky and miss when running at low engine speeds?

3—What causes this car to back-fire when going down hill and what can be done to remedy this? Car is equipped with a Master carbureter.—Philip Baker, Pittsburgh, Penn.

1—If the valve guides are not too badly worn they can be reamed out and valves with oversize stems fitted. Should the guides be worn so that it is not possible to use an oversize stem, the guides can be reamed out and bushings fitted.

2—As long as there is excessive wear the valve action will be poor and air will be admitted around the valve stems. The jerky action resulting will be most noticeable when the engine is throttled down. As long as this condition exists it will be impossible to adjust the carbureter so that smooth running can be obtained at low speeds.

3—If you refer to backfiring in the muffler it is only a natural condition. If the engine is running at high speed and the throttle is closed and the car

Rebuilding Ford Sport Car

Q—Give instruction for building a Ford sport car. Can the frame be lowered without much expense? Can a body with lines similar to those of the Stutz roadster be used on the car with the present wheelbase? How much can the valve size be increased without interfering with the water jackets? What would be gained by using a high tension magneto and removing the magnets from the flywheel?

2—How can a deep toned exhaust sound be obtained from a small engine such as the Ford?

3—Would a speed of 60 miles per hour be possible with the rebuilt job?

1—A few years ago it was necessary to work out all of the details in connection with the rebuilding of a Ford for some special purpose. At present there are many manufacturers that can furnish any special part necessary at a very reasonable price. Some of the companies have built cars for the track and have obtained very successful results. It is not uncommon to find a car that has been rebuilt at a cost of at least $2,500. If you intend to build a sport car it would be advisable to consult some of the manufacturers and get the approximate cost of the parts that will be necessary to build the kind of a car you wish.

Parts for underslinging the frame can be purchased at a low cost and blue prints are furnished to aid in making the installation. The valve size can be increased about 3/16 in. without interfering with the water jackets. If a high tension magneto is used the magneto can be removed from the flywheel and considerable drag will be eliminated. When doing this the brass screws and magnet supports should be left as the screws will kick up almost as much oil as the magnets. It will be necessary to shorten the screws a little.

Special parts for rebuilding the Ford can be obtained from the following companies:

Laurel Motors Corp., Anderson, Ind.

Speedway Engineering Corp., Indianapolis, Ind.

Paco Mfg. Co., Peoria, Ill.

Lehmann Mfg. Co., Pannelton, Ind.

2—The deep toned exhaust can be obtained from a small engine by using a small exhaust pipe and leading it into a can of considerably larger diameter. Several holes should be drilled in the can to permit the gases to escape and prevent back pressure.

3—The speed which can be obtained from a rebuilt job of this kind is dependent upon what changes have been made and how well the work has been done. Many of the jobs have attained speeds of from 60 to 80 miles per hour.

allowed to coast the exhaust pipe being very hot will ignite the charges that get into the exhaust during the time of coasting. If, however, the popping back occurs in the carbureter it is an indication of a sticking intake valve.

BULB SIZES

Q—My 1918 Ford magneto, just renewed, will be relied on for lighting exclusively. What voltage lamps and what precautions are necessary to avoid burning them out and insuring a somewhat steady light. A Bosch high tension is used for ignition.—Carl Backe, San Francisco, Calif.

If the series connection is used you should have two 9 volt bulbs for the headlights. A 9 volt 4 c.p. bulb can be supplied for the tail light. There are no particular precautions that can be taken to prevent the bulbs from burning out. If the right kind of bulbs are supplied there is no reason why trouble should develop.

GEAR SHIFTING

Q—Give the hp. rating of the 1914 Stevens Duryea engine.

2—It is impossible to shift from high to neutral or low until the car is almost stopped. What is the cause?

3—Is the oiling system used on the new car the same as the one used on the 1914 model?

1—The hp. rating of this engine is 45.

2—Fig. 9 is a sketch showing the gear shifts and you can see that when going from high to first or reverse it is necessary to go through second. In making the change from third to second the car speed must be below 5 m.p.h. without what is known as the double foot shift, or it is possible at higher speeds than this to depress the clutch, pull the gear

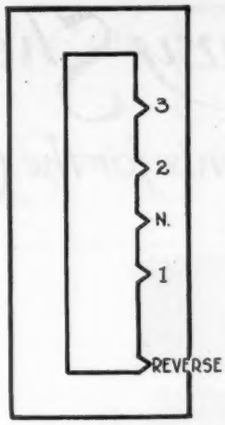


Fig. 9. Gearshift layout on the 1914 Stevens Duryea

shift out of third, leave the clutch in, speed engine up to a higher speed, take out clutch and as clutch speed decreases drop into second. It is quite a knack and takes considerable practice before this is accomplished without undue cashing of the gears.

3—The lubrication on the 1914 model is accomplished by means of a mechanical oiler and crankcase pans under the connecting rods. The system used on the new cars is practically the same.

INCREASING ENGINE SPEED

Q—We are making a speedster and desire to know how to run an engine faster. For instance; a Mason engine used in a F. B. Chevrolet. Is it by advancing the valve timing and no lag over exhaust and inlet or could we get the same camshaft to perform the same duty, getting 3,500 to 4,000 r.p.m.?

2—Would De Luxe pistons used with aluminum connecting rods stand up for dirt track racing?

1—The biggest factor controlling engine speed is the size of the intake valves. As a matter of fact the entire valve layout determines to a great extent what the engine performance will be. The use of lighter reciprocating parts and larger valves will increase the engine speed but we do not believe it will be possible to get this particular engine up to a speed of 3,500 r.p.m. If the valve timing is increased by setting the timing gears one tooth ahead, greater car speed will be possible and much better running will result at high speeds but the operation at low speeds will be very unsatisfactory.

2—The De Luxe lightweight pistons have been used in jobs rebuilt for racing purposes with highly satisfactory results. The clearance recommended by the manufacturers for a 3⅛ in. piston is .0025 in.

LOOSE BEARINGS

Q—The bearings on a Buick D 45 do not seem to hold up as they should. After having them taken up they only hold up about 200 miles when the main and connecting rod bearings loosen up. Have heard that the babbitts were all too soft in these models. What remedy would you suggest? Can I get bronze bushings fitted or isn't this advisable? Can I get hard babbitts and where?

2—What is the compression power of this engine?—Arthur C. Gravel, Bryn Mawr, Pa.

1—Possibly the babbitt is too soft or the bearings are so badly worn that it is impossible to take them up and have them hold. Also the crankshaft may be worn slightly out of round which would cause the bearings to loosen up very quickly. We would suggest taking the engine down, micrometer the shaft carefully and determine the condition of the bearings. If the shaft is found in condition, a set of new bearings properly fitted will probably remedy the trouble. The advisable thing to do is to purchase new bearings from the Buick factory as they are in a position to furnish parts for all of the models.

2—Compression on this car should show about 70 lbs. per sq. in. gage pressure.

EFFECT OF VACUUM DEVICES

Q—What effect does an automatic windshield wiper have on the running of an engine when attached either to the manifold or vacuum tank?—Dr. Garratt, Seattle, Wash.

Practically speaking there will be no noticeable difference in engine performance when the automatic windshield wiper is in use. The use of a vacuum tank has an effect on manifold conditions but it is not possible to determine what the effect is without the use of a carefully calibrated vacuum gage connected to the manifold.

PAIGE 6-66

Q—What is the gear ratio and the r.p.m. of the new Paige? What gear ratio was used in the Paige that made the world's record?—H. B. Martin, Greenwood, S. C.

The gear ratio of the new Paige 6-66 is 4.55 to 1 and the engine maximum speed is 3400 r.p.m. We are not in a position to furnish the gear ratio used when the record was set.

Mysterious Engine Trouble

I am a reader of the MOTOR AGE and I would like to state my troubles to you and find out whether you can help solve them. I will also state that I am a mechanic with four years' experience. I own and drive an Oakland Six, 1916 32-B car and I confess I am whipped. This car will not idle. About a year ago it stopped idling all of a sudden and has not idled since. When the gas throttle is closed it stops. I located a manifold leak and stopped it, but it did not help much. I have tried five makes of carburetors on it and Zenith works the best. It will not idle on this engine but will on others. Could there be a leak in the cylinder head? It must be pretty large as the motor stops pretty quick. I tried the vacuum tank but it doesn't cause it. I tried the manifold every way but can find no leak there. Idling is not the only trouble as it lacks power and speed. It will not do over 40 and it has just been overhauled. Here is a list of things I have checked over and OK'd:—valve springs are very stiff—rocker arms and rods adjusted O. K.—valve lifters and brackets new—points in good shape—spark extra good—valves just reground. A little loose around the stems although not very bad. I do not know about the amount of compression in the cylinders (in pounds.) It is about average for an Oakland. I installed one Inland ring and two Burd-quick seating rings per cylinder and fitted them properly. The compression is about equal on all cylinders.

The ignition timing is plenty early. I suspect the valve timing. The camshaft gear has many marks on it so they cannot all be right. The flywheel has marks on it but I do not know what the marks relate to. This engine hits good standing still at high speed; also on the road up to 40 m.p.h., where the limit is reached. It will not miss then but will go no faster. It slows down on a hill also. I use lots of gas with the carburetor as lean as it should be. I have some trouble with oil thinning but I am not worried about that. I have a hot-spot manifold and this helps a little but it must not be used too much as it slows down motor making it hit smoother but cuts power. This is a long item of things which I have told you and I can't see what ails it. I think it must be valve timing. This motor has a louder and snappier exhaust than other Oakland cars.

Please tell me how to match up the marks on the flywheel to the place where they correspond to as I see no other marks. If you can give me some light on this freak engine I would sure appreciate it. These conditions I have named are as near the truth as I can understand it. I am not writing you of a condition which does not exist except on imagination but one which I know exists on this car as I have driven it for two years.—Harley Davidson, Lewisburg, Ohio.

The fact that the exhaust sounds much louder on this car than is customary indicates either faulty timed valves or late timed ignition. Other than this we can suggest nothing and would be pleased to hear from any of our readers who have had a similar experience.

The Accessory Show Case

New Fitments for the Car

Combination Radiator Funnel Cap

Made of highly polished cast aluminum, this radiator funnel cap serves as a stationary filler cap, an overheat indicator, a radiator cooler, a funnel, and an ornament. Once installed it does not have to be unscrewed. Visible day or night, it warns instantly, by a thin wisp of steam emitted from the funnel, when the engine is overheated or the water low in the radiator. It also assists in reducing the temperature of the water in the cooling system, by allowing, when in partially open position, air to be blown into the radiator. It sells for $3.75 by the Radiator Funnel Cap Co., 3852 Grand Boulevard, Chicago.

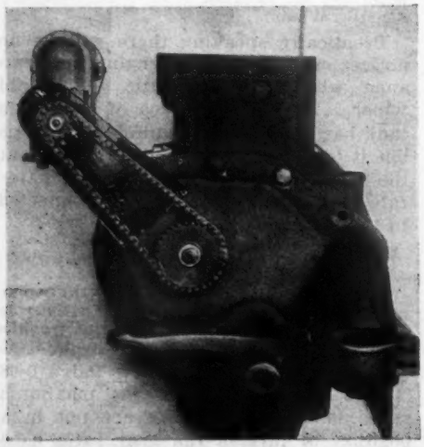
Ford Magneto Attachment

The Magneto Attachment Co., 3608 Park avenue, New York City, has recently announced a special attachment for Ford engines that allows the use of any standard magneto for ignition equipment.

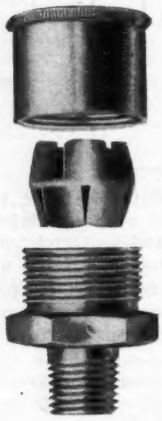
A gear is secured to the front end of the camshaft which meshes with a silent chain driving a small pinion gear on a bracket placed on the right-hand side of the engine. The pinion gear is driven at crank shaft speed and is entirely enclosed to exclude dust.

Gear Shift Lock

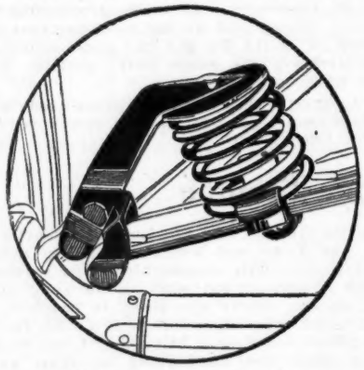
The A. A. C. lock is designed to lock the gear shift lever to the instrument board or the heel board of the front seat. It consists of a specially constructed socket with a nut for securing it, a connecting bar and a padlock. This lock can be had to fit practically any standard made automobile. The installation is simple, requiring only a few minutes to complete the work. Price $4. Automotive Appliance Corp., Indianapolis, Ind.



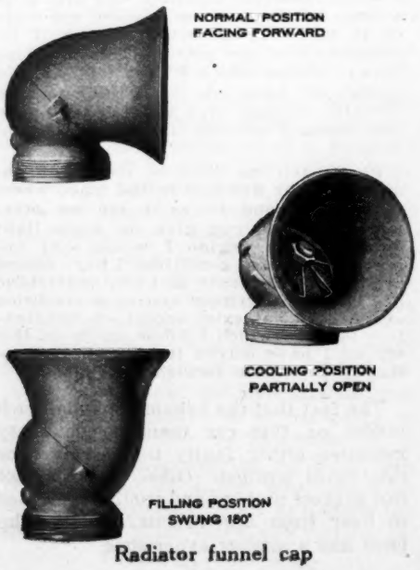
Ford magneto attachment



Rex tube couplings



Glidewell shock absorber



Radiator funnel cap

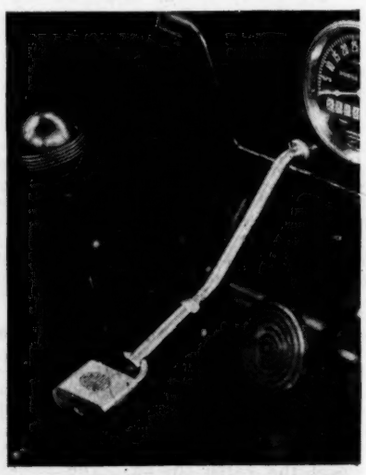
Glidewell Shock Absorber

Worked out along the laws of compound leverage, the new Glidewell shock absorber for Fords made by the Glidewell Mfg. Co., Richmond, Ind., does not change the regular Ford construction. As will be noticed in the illustration it is not necessary to take off the wheels. The normal body weight does not compress the coil springs thus allowing full range of action for the coil spring when the passenger load is added. The action of the regular Ford transverse springs is not destroyed as by the principle of compound leverage employed, the coil spring is claimed to absorb the constant road vibrations which are not absorbed by the Ford springs.

Rex Tube Couplings

Rex tube couplings are made in three pieces, a compression sleeve and two compression collars which, when screwed together, exert a heavy pressure on the laminated ends of the sleeve, forcing it firmly into the fabric of the hose. An advantage of this coupling is that it is attached to the outside of the hose and does not reduce the opening or inside diameter, thus permitting the free flow of gasoline or air.

Another feature is that the coupling is so constructed that one of the compression collars comes in contact with the inside steel tubing. They are turned from high quality brass castings and are especially designed for use on Rex tube gasoline and air hose. Brigg's standard thread, commonly called iron pipe thread, is supplied unless otherwise specified. Chicago Tubing & Braiding Co., 216 N. Clinton street, Chicago.



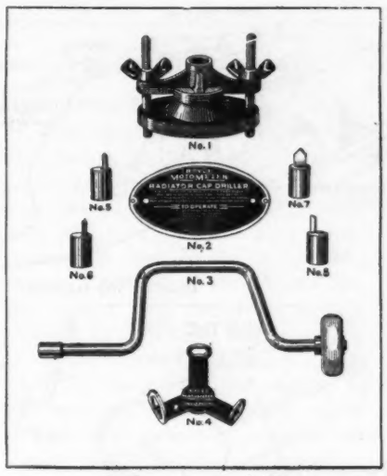
A. A. C gearshift lock

Service Equipment

Time Savers for the Shop

Self-Adjusting Gear Puller

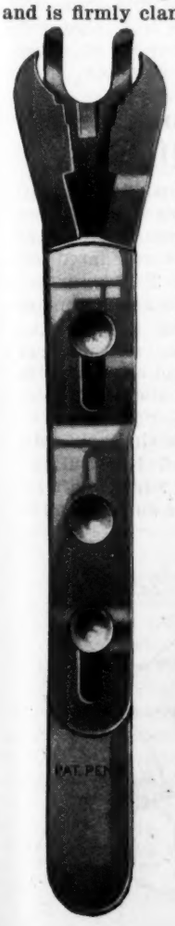
This tool is instantly adjustable without changing any pins or set screws and one of its features is that the harder you pull, the tighter it grips the gear being pulled. The pulling arms are made of a specially prepared steel that is claimed to withstand the hard use the average gear puller is subjected to, and a special heat treatment adds to their tensile strength. The screw is claimed not to twist or strip the threads. It is made in three sizes, Nos. 10, 20 and 30. The No. 10 puller will take gears up to 6 in. in diameter, the No. 20 up to 9 in. and the No. 30 up to 18 in. in diameter. The No. 30 can also be used for pulling any size wheel. Geo. L. Hunt Mfg. Co., Inc., Boscobel, Wis.



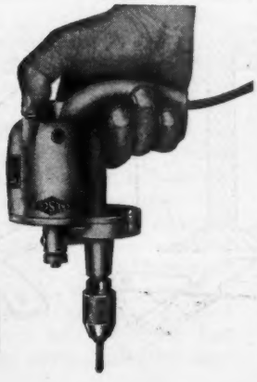
Radiator cap driller

Porter Elevating Tool Post

The Porter elevating tool post is a new addition to the line of Skeleton tools. It swings in a complete circle and is firmly clamped to the lathe cross-slide by the tightening of nuts, entirely independent of both the tool-clamping and elevating screws. All parts of the tool post are rigidly clamped and the appliance is sufficiently massive, it is claimed, to do away with vibration. Turning a hand screw elevates an auxiliary slide carrying the tool, and the slide is tightened by two screws in the body of the tool post which clamp the dovetail in the slide. This tool carrying slide has more than an inch of travel and the tool can be raised or depressed without changing its angle, preserving rigidity at all times. Cost $25. Skelton Tool Co., Syracuse, N. Y.



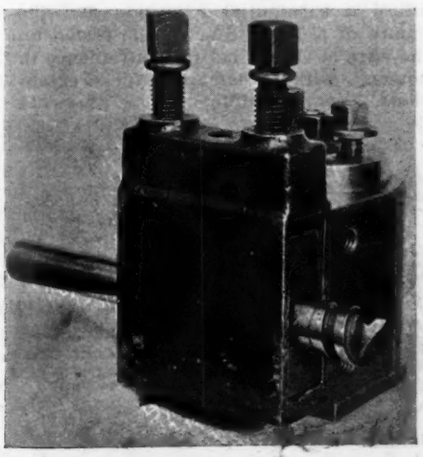
Left: Valve keeper inserter
Below: Knight electric drill



Knight Electric Drill

This electric drill is especially useful for drilling holes for cotter pins, name plates or any small holes in metal.

The motor is guaranteed to carry a ¼ in. drill bit at a chuck speed of 900 r.p.m., and is designed to operate from either alternating or direct current, 110 volt circuit. The motor is air cooled. The housing of this drill is made of aluminum. The pistol grip is designed to fit the hand and is on a direct line with the chuck giving a straight line pressure on the drill bit. A switch button operated by the thumb controls the power. Knight Engineering & Sales Co., 447 East Third street, Los Angeles.



Elevating tool post

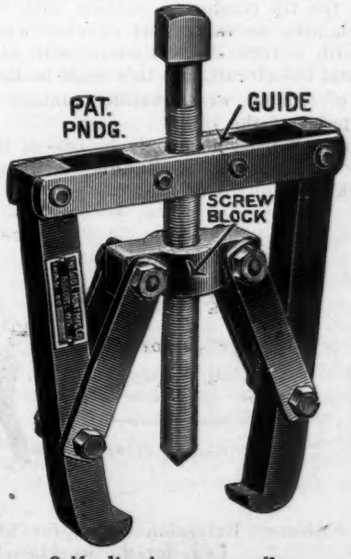
Boyce Moto-Meter Radiator Cap Driller

The Boyce moto-meter radiator cap driller is designed to simplify the work of installing Boyce moto-meters. It holds the radiator cap securely against rotation and enables one to center the hole perfectly. There is said to be no risk involved of chipping and splitting the surface of the radiator cap as with an ordinary twist drill. There is a drill for every model Boyce moto-meter. Price to dealers, $6.50. Moto Meter Co., Inc., Long Island City, New York.

Valve Keeper Inserter

This tool, manufactured by the Service Equipment Co., Kansas City, Mo., is claimed to greatly simplify the work of valve grinding by making it possible to remove and replace the valve keepers or keys in a few minutes in place of several hours. It is adjustable to the various sizes and shapes of keepers through jaws that open and close by the simple action of pulling or pushing with the thumb on a knob on the tool handle. In addition to gripping the keeper by these jaws the tool supports it by a frame under the jaws.

The tool is said to retain its firm grip on the keeper until the valve spring has been replaced and the cup supporting the spring is fully down and in place on the keeper. The drop of the cup on the keeper releases the tool and it is then withdrawn. The pin and flat key keepers when gripped are centered in the tool and since the slot in the end of the frame supporting the jaws fits the stem diameter, the pin is centered to the hole and placed exactly for quick insertion.



Self-adjusting gear puller

The Automotive Repair Shop

Practical Maintenance Hints

Simple Method of Clearing Gasoline Piping

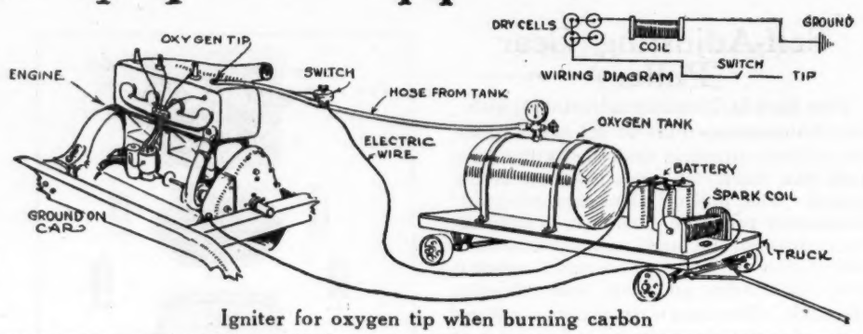
A simple method to clear gasoline piping of obstructions without removing parts is shown in the sketch. This consists of entirely filling the tank with gasoline. That is, the tank must be filled until the gasoline overflows the filling spout to get rid of any pockets of air. Screw the filling cap on tight and plug the venthole with a piece of wood driven in. Strike the tank a sharp blow with the fist or a mallet. The pressure from the blow is exerted equally in all directions and the obstruction in the pipeline being the point of least resistance will be dislodged. This method will start gasoline flowing under any conditions where the pipe can be opened with air pressure.

Igniter for Oxygen Tip When Burning Carbon

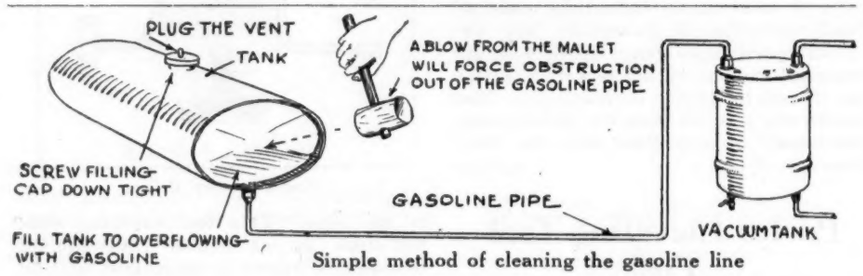
To overcome the necessity of dropping a piece of burning gasoline-soaked waste into the cylinders to start the oxygen tip or light it after it is extinguished, a serviceable method is to use four dry cells and a spark coil wired as shown. Wherever the tip of the oxygen pilot is brought in contact with the inside of the cylinders a spark occurs which instantly ignites the gas. With this method the tip is pushed around the inside of the cylinders and the spots of unburned carbon which invariably remain are reached and burned off.

A small switch in circuit is pressed with the finger to give current only when the flame is out. It is understood that the tip coming in contact with the spark plug or valve port opening when the tip enters the cylinders will also ground the circuit, and this must be kept out of contact when making contact at the point of the tip.

The coil used need only be one of the type as used for gas lighting or jump-spark ignition.



Igniter for oxygen tip when burning carbon


PLUG THE VENT
TANK
A BLOW FROM THE MALLET WILL FORCE OBSTRUCTION OUT OF THE GASOLINE PIPE
SCREW FILLING CAP DOWN TIGHT
GASOLINE PIPE
FILL TANK TO OVERFLOWING WITH GASOLINE
VACUUM TANK

Simple method of cleaning the gasoline line

Substantial Extension Elbow for Funnel

Malleable iron pipe fittings connected as shown in the drawing are used by a local gasoline filling station in conjunction with funnels for filling auomobile tanks where the position of the filler opening requires an elbow extension. Light brass elbow extensions as formerly used would not stand up for any length of service, inasmuch as the elbow seams would open and leakage of quantities of gasoline would result. Two types of extensions are used, one is a straight offset extension and the other a right angled offset or elbow.

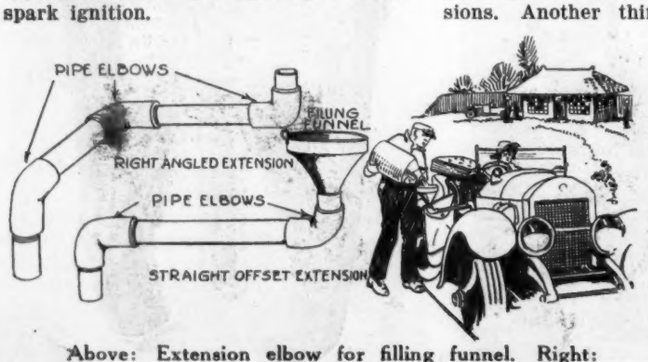
These shapes permit of serving a tank in any location regardless of tire brackets, frame extensions, or concealed tanks inside of closed cars. The pipe fittings afford a substantial extension and the mouth of a 5 gal. can, can be rested on the edge of the funnel for convenience in pouring, without damaging these extensions. Another thing which does not harm these extensions is careless use.

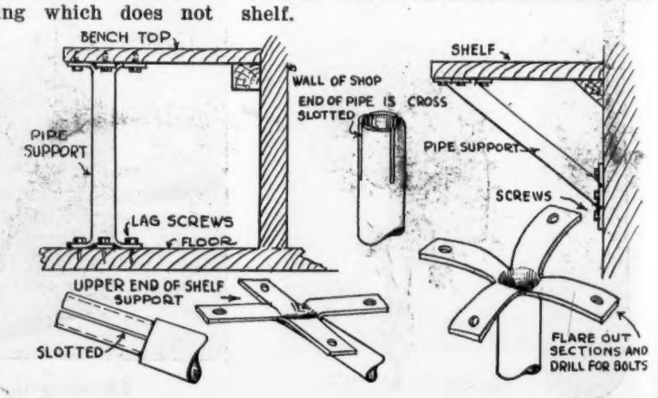
Should one be dropped or thrown down, no injury can result from this abuse inasmuch as the malleable iron pipe will stand practically any amount of abuse without any evidence of cracking.

Legs for the Work Bench or Shelf

Substantial legs for supporting a small or large work bench can be made up readily from lengths of wrought iron pipe the ends of which are split and flared out as shown in the drawing. Two splits are made crosswise of the pipe and the metal turned out square to the body of the pipe. Where this is done at each end the pipe is then drilled and secured with lag screws making a neat and substantial support.

For shelf use the pipe is similarly split but the ends are turned to positions which correspond to the surface of the side wall and to the under surface of the shelf.





Above: Extension elbow for filling funnel. Right: Legs for the workbench or shelf

Law in Your Business

By Wellington Gustin

At Your Service

SEEMINGLY knotty legal problems are constantly arising in the dealer's business, which even a slight knowledge of the law easily may solve. MOTOR AGE presents here the most common legal problems which confront the dealer. Mr. Gustin, a member of the Chicago bar, not only is well versed in the law relating to the dealer, but presents it in such a way as to be readily understood by the layman. In addition to his articles, Mr. Gustin will gladly answer such individual inquiries on knotty points as may be submitted to him.

Where the Garagekeeper May and May Not Recover for Storage

IN a recent Texas case the court held that where the owner of an automobile, which was being held by a garagekeeper for repair charges, sued to recover the automobile and tendered bond to protect the garagekeeper and the garagekeeper retained the automobile by furnishing a replevy bond, his lien did not cover storage charges for the period of time in which he was in possession of the automobile after having replevied it, since he would have been protected without the retention of the automobile by the first mentioned bond. It appears there arose a dispute over the charges for repairs on an automobile whereupon the garagekeeper refused to surrender possession of it but held it in storage, under his claim of lien until charges were paid.

To the repair charges the garagekeeper added his regular storage charges after the customer declined to pay the repair charges and receive the car. On trial the garageman asked judgment for the original debt for labor and repairs, also for the storage charges and for foreclosure of lien and order of sale of the car in satisfaction of all charges. In order to obtain the car the customer sought to substitute a bond in lien of possession of the garagekeeper. The court said this bond, being in an amount double the value of the car, was quite sufficient to make the garagekeeper safe for all he claimed without retaining the car in his possession and storing it.

He, of course, but exercised a legal right conferred by statute when he replevied, but after having replevied the court said he could not exercise a use of the property as by putting it in storage which would make it contribute revenue to the business pursued by him and by this process force upon the customer involuntary contribution to the business, compelling him, contrary to his wishes, through a course of action pursued by the garagekeeper not necessary to the latter's full protection. The use of the automobile was also charged against the garagekeeper. In another case, Malcolm against Sims-Thompson Motor Car Co., 164 S. W. 924, another Texas case, the owner of a car refused to pay the bill and after the car had remained in storage several months, during which time demands for payment had been made and refused the motor car company gave the owner the notice required by statute as a step precedent to executing the lien and making sale, under the Texas laws, and advertised the car for sale. Then the owner instituted suit, and a jury awarded the full amount including storage charges. In this case however there was no other proceeding of any kind, as in the former case, by the owner to take possession of the car and indemnify the garagekeeper in case of loss of the action.

Laws Regulating Repairshops in New York

What laws govern the operation of a garage and repairshop, and what permits and licenses are necessary in New York City and New York state?

Article 11, Secs. 150 to 160; and article 12, Secs. 170 and 171, under the division entitled "Explosives and Hazardous Trades" of Cosby's Code of Ordinances, New York City, 1909, pages 300 to 305, will answer your questions as to the local New York City regulations. These laws are too lengthy to give here, and you should be able to see them at your public library. You will have to study these laws for your strict compliance with them will be necessary upon opening your garage. When you make application for a permit to operate a garage, at your city hall, any obscure point will be explained to you, or should be.

General laws of business apply to the garage owner, in addition to the special ones. He holds the cars of his customers for no other purpose than to care for them during the continuance of the relation in accordance with the contract, and to redeliver such cars upon termination of the contract relation. He is not an insurer of the cars entrusted to his care, but is bound to take the same care of them that men do of their own property.

A garage proprietor is required "to exert in his calling the diligence which good business men in this specialty are accustomed to exert." This obligation involves, among other things, a duty to take reasonable care that any building used for the purpose is in a proper state, so that the thing deposited may be reasonably safe in it, but no warranty or obligation is to be implied by the law on his part that the building is absolutely safe.

The garagekeeper is liable for his or his servant's negligence in dealing with the cars of his customers, but he is not liable for loss or injury that is caused by (1) lightning, earthquake, tornadoes, storms and the like; (2) by inevitable accident as by fire, burglary, etc., unless by exercising ordinary diligence, loss by reason of these causes could have been averted.

Should the keeper with the intent to deprive the car owner of his property, and without his consent, convert the same to his own use he would be guilty of embezzlement.

These are some of the more important general principles applying to the garage owner.

New York gives the garagekeeper a lien as follows: Sec. 184, Lien Law, Lien of bailee of motor vehicles. "A person keeping a garage or place for the storage, maintenance, keeping or repair of motor vehicles, as defined by article eleven of the highway law, and who in connection therewith stores, maintains, keeps or repairs any motor vehicle or furnishes gasoline or other supplies therefor, at the request or with the consent of the owner, whether such owner be a conditional vendee or a mortgager remaining in possession or otherwise, has a lien upon such motor vehicle for the sum due for such storing, maintaining, keeping or repairing of such motor vehicle or for furnishing gasoline or other supplies therefor and may detain such motor vehicle at any time it may be lawfully in his possession until such sum is paid."

Note that under this lien possession of the car is necessary.

Passenger Car Serial Numbers

Motor Age Maintenance Data Sheet No. 147

One of a series of weekly pages of information valuable to service men and dealers—save this page

LEXINGTON (Formerly Howard)

Year	Model	Cyls.	Price	Serial Numbers
1913	D-F	4	$1750	
	G	6	2500	
				Number plate on tonneau floor board
1914	4-H	4	1335	
1915	4-K	4	1375	
	6-L	6	1875	
	6-M	6	2575	
1916	6-N	6	1875	
				Number plate on dash, right side, under hood
	6-O-16	6	1075	
1917	6-O-17	6	1185-1285	
				Number plate on dash, right side under hood, and on top of fly-wheel housing
	6-P	6	2875	Number plate on dash, right side, under hood
1918	O	6	1345	
	R	6	1585-1685	
				Number plate on dash, right side under hood, left front spring and on left rear kick-up
1919	R-19	6	1785	17296
1920	S	6	1885	18001 up
				Number plate on dash, right side under hood, on left front spring crown, left rear motor arm, and on right side of rear side rail

LIBERTY

Year	Model	Cyls.	Price	Serial Numbers
1916	10-A	6	$1095	30501-31500
1917	10-B	6	1195	31501-33500 approximately
1918	10-B	6	.....	33501-36450
1919	10-B	6	.....	36451-42250
1920	10-C	6	.....	50500 up
				Numbers on left side front frame end; motor numbers, 21001 to 27001, on left side of motor

LOCOMOBILE

Year	Model	Cyls.	Price	Serial Numbers
1912	L	4	$3500	
	M	6	4800	
1913	L	4	3600	
	R	6	4400	
	M	6	5100	
1914	38 RD & LD	6	4400	
	48 RD & LD	6	5100	
1915	38R-5	6	4400	
	48M-5	6	5100	
1916	38	6	4400	(Refuse to give serial numbers)
	48	6	5100	
1917	38	6	4600	
	48	6	4600	
1918	38	6	5000	
	48	6	5950	
1919	38	6	.....	
	48	6	.....	
1920	38	6	.....	
	48	6	8100	

LORRAINE (Previous to 1920, See Hackett)

Year	Model	Cyls.	Price	Serial Numbers
1920	.....	4	$1425	1000

MAIBOHM

Year	Model	Cyls.	Price	Serial Numbers
1917	A	4	$830	1-500
				Number plate on dash or under front seat
1918	B	6	1290	501-2350
1919	B	6	1395	2351-6200
1920	B	6	1395	6201 up
				Number plate on left side engine Engine number same as car number

MARMON

Year	Model	Cyls.	Price	Serial Numbers
1912	32	4	$2750	112001-1212001
1913	32	4	3000	2113001-2813001
	48	6	5000	1113002-1813000
1914	41	6	3250	114002-814000
	48	6	5000	1114002-1814000
1915	41	6	3250	115002-815000
	48	6	5000	1215002-1815000
1916	41	6	3250	116002-816000
	34	6	2750	1516002-1816000
1917	34	6	3100-5500	317002-817000
1918	34	6	3550-6500	418002-818000
1919	34	6	3950-5750	419001-819001
1920	34	6	4650-6450	2200001-8200001
				Numbers on heel board of driver's seat and on left side of main frame

MAXWELL

Year	Model	Cyls.	Price	Serial Numbers
1912	16	2	$625	
	25	4	950	
	30	4	1150	
	36	4	1480	
1913	22	4	785	
	30	4	1145	
	40	4	1675	
1914	25	4	750	
	35	4	1225	1-14000
	50-6	6	1975	
1915	25	4	695	
		Gas Light	750	14001-52000
		Electric Light		52001-113205
1916	25	4	655	
1917	25 7- 1-16	4	595	
	1- 1-17	4	635	113206-193800
	1- 1-17	4	665	
1918	25 7- 1-17	4	655	
	8- 6-17	4	745	193801-239822
	3- 1-18	4	825	
1919	25 7- 1-18	4	825	239823-266800
	10- 4-18	4	895	
1920	25 7- 1-19	4	895	266801 up
	7-12-19	4	985	
				Number on name plate on right end of front seat base

McFARLAN

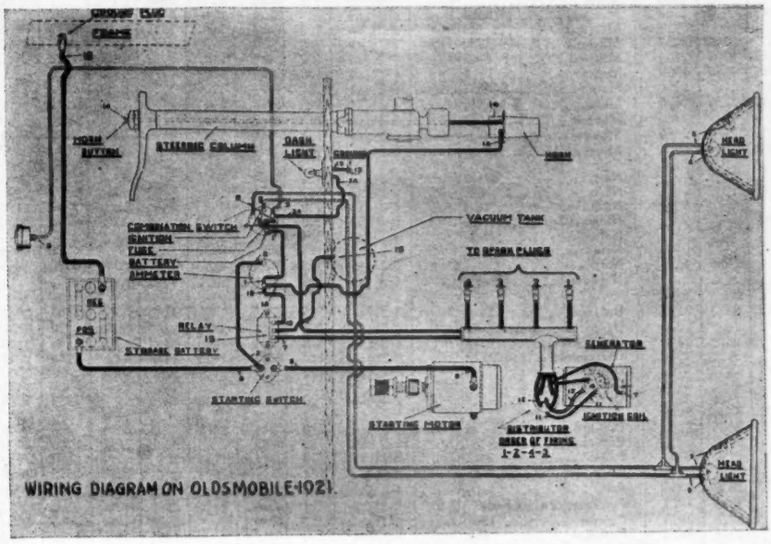
Year	Model	Cyls.	Price	Serial Numbers
1912	26	6	$2100	500-1000
1913	27	6	2590	3000-4000
1914	65	6	2900	4000-6000
1915	77	6	2900	6000-7000
1916	107	6	2900	9000-10000
1917	127	6	3200	10000-11000
1918	127	6	3900-4300	18000 up
1919	127	6	.....	19000-19999
1920	.....	....	.....	20000 up
				Number plate on dash and on right frame horn

MERCER

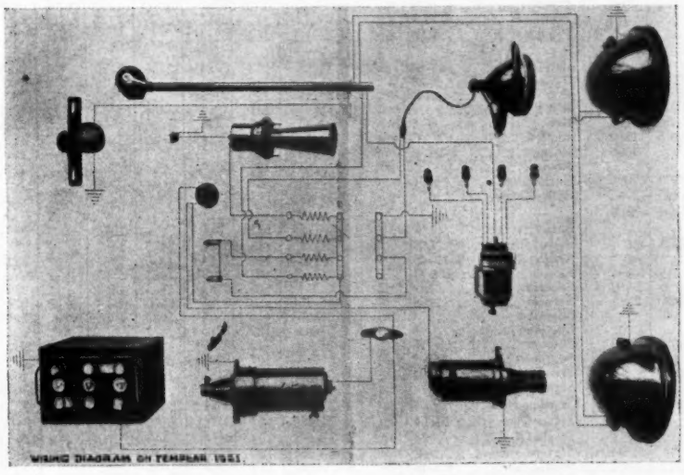
Year	Model	Cyls.	Price	Serial Numbers
1912	35R	4	$2500	
	35 AB	4	2750	588-990
1913	J & K	4	2700	991-1590
	G	4	2900	
1914	35J	4	2600	1591-2098
	35 HO	4	2900	
1915	22-70	4	3000	2099-2549
1916	22-72	4	3000	2550-3299
1917	22-73	4	3500	3300-4099
1918	Series 4	4	4200	
			4500	4100-4600
1919	Series 5	4	4200	
			4500	4600 up
1920	Series 5	4	4950	
				Number on dash plate

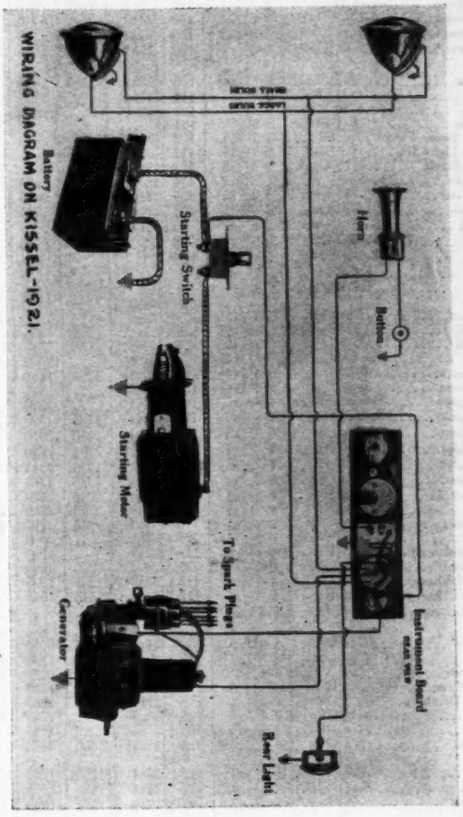
Motor Age Weekly Wiring Chart No. 125

1921 Oldsmobile—Auto Lite & Remy System



1921 Templar—Bijur System





1921 Kissel Remy System

Name of Car and Date on Which Wiriing Diagrams Have Appeared in Previous Issues

Allen—Sept. 30, '20
American Beauty—Feb. 17, '21
Buick—Dec. 23, '20
Cadillac—Nov. 18, '20
Case—Oct. 7, '20; Feb. 17, '21
Chalmers—Feb. 24, '21
Cleveland—Feb. 24, '21
Cole—Dec. 9, '20
Jan. 6, '21; Jan. 20, '21
Daniels—Feb. 17, '21
Dorris—Dec. 9, '20;
Feb. 24, '21
Elcar—Oct. 28, '20
Dec. 2, '20
Elgin—Oct. 14, '20
Elkhart—March 3, '20
Franklin—Dec. 2, '20
Gardner—Apr. 14, '21
Grant—Nov. 25, '20; March 31, '21
Hudson—Jan. 13, '21
March 17, '21
Hupmobile—Feb. 3, '21
Apr. 14, '21
Jackson—March 17, '21
Jordan—March 10, '21
King—March 3, '21
Kissel—Oct. 21, '20
Klinekar—Apr. 14, '21
Lexington—Dec. 16, '20
McFarland—March 24, '21
Mercer—March 24, '21
Mitchell—Jan. 6, '21; Apr. 21, '21
Moore—Nov. 11, '20
Moline-Knight—Nov. 4, '20
Monitor—March 31, '21
National—Dec. 16, '20
March 10, '21
Oakland—March 24, '21
Oldsmobile—Nov. 25, '20; Dec. 23, '20; Apr. 21, '21
Packard—Oct. 7, '20
March 31, '21
Paige—March 10, '21
Peerless—Nov. 18, '20
March 3, '21
Pierce-Arrow—April 21, '21
Premier—Feb. 10, '21
Reo—Feb. 10, '21
Roamer—Dec. 30, '20
Feb. 10, '21
Saxon—Oct. 21, '20
Dec. 30, '20
Scripps-Booth—Feb. 3, '21
Sheridan—Feb. 3, '21
Stearns—Nov. 4, '20
Jan. 13, '21
Stephens—Sept. 16, '20
Studebaker—Oct. 29, '20
Velie—Jan. 20, '21
Willys-Knight—Oct. 14, '20

Additional Wiring Diagrams May Be Found in the Readers' Clearing House in This Issue

Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace G	Guy	6-3¼x5	123	32x4	$2975	$2975	....	$3680	$3680
Ace H	H-S	6-3⅝x5	123	32x4	2975	2975	....	3680	3680
Ace L	H-S	6-3¼x5	116	32x4	2260	2260	....	....	....
Allen Series 43	Own	4-3½x5	110	32x4	‡1395	1395	....	....	2395
Ambassador R	Cont	12-2⅞x5	136	32x4½	....	†4500	$4500	....	6500
Amco 1921	H-S	4-3½x5	114	31x4	....	....	....	....	....
American Six C	H-S	6-3¼x5	127	32x4	2395	2395	2475	3295	3495
Anderson Series 40	Cont	6-3¼x4½	120	33x4	2195	1795	1845	2795	2795
Apperson 8-21-S	Own	8-3¼x5	130	34x4½	....	†3500	3500	4500	4500
Apperson Anniversary	Own	8-3¼x5	130	34x4½	....	†4250	4250	....	....
Auburn 6-39	Cont	6-3¼x4½	120	33x4	1745	1695	†1695	2795	2795
Borgs 20T	Cont	6-3¼x4½	120	33x4	1885	1885	....	2785	2885
Bell 4-32	H-S	4-3½x5	114	31x4	....	1495	....	....	....
Bell 6-50	H-S	6-3¼x5	124	32x4	....	1695	....	....	....
Biddle B-1	Buda	3-3⅞x5½	121	....	....	....	....	....	....
Birch Super-Four	H-S	4-3½x5	117	33x4	....	....	....	....	....
Birch Light Six	H-S	6-3¼x5	117	33x4	....	....	....	....	....
Bour-Davis 21S	Cont	6-3½x5¼	126	33x4½	†2585	....	2585	....	....
Bradley Four	....	4-3½x5	116	33x4	....	1265	....	....	....
Brewster 91	Own	4-4 x5½	125	32x4½	†7900	9000	....	....	10500
Briscoe 4-34	Own	4-3⅜x5	109	31x4	1285	1285	....	1885	1885
Brook S-21 A	Own	2-3½x3⅜	90	28x3	395	....	....	....	....
Buick 21-44-5-6-7	Own	6-3⅜x4½	118	33x4§	1795	1795	....	2585	2895
Buick 21-48-9-50	Own	6-3⅜x4½	124	24x4½	....	....	2065	2985	3295
Bush E.C.4	Lyc	4-3½x5	....	....	....	1245	....	....	....
Bush E.C 6	Rut	6-3½x5	....	....	....	1575	....	2050	2150
Cadillac 59	Own	8-3½x5½	125	34x4½	3790	†3790	....	....	4950
Carroll 6	Dues	6-3½x5	132	35x5	....	....	3940	....	5190
Carroll 6	Dues	6-3½x5	128	....	3985	3985	....	....	....
Case V	Cont	6-3½x5¼	128	....	3185	3185	....	....	....
Chalmers 6-30	Own	6-3¼x4½	126	34x4½	....	†2650	2650	3400	3750
Chalmers 6-30	Own	6-3¼x4½	117	32x4	1795	1795	1915	2595	2745
Champion Tourist	Own	6-3¼x4½	122	33x4½	....	....	1945	....	....
Champion Special	Lycom	4-3½x5	113	32x3½	....	1250	....	....	....
Chandler Six	H-S	4-3½x5	118	32x4	†1595	1595	....	....	....
Chevrolet 490	Own	6-3½x5	123	33x4	1930	†2010	1930	2930	3030
Chevrolet FB	Own	4-3¼x4	102	30x3½	795	820	....	1325	1375
Cleveland 40	Own	4-3¼x5½	110	33x4	1320	1345	....	2075	2075
Climber Six S	H-S	6-3¼x5	125½	32x4½	2750	2750	....	2375	2475
Cole 870	Nort	8-3½x4½	127	33x5	3250	†3250	3250	4250	4450
Columbia D-C &CS	Cont	6-3¼x4½	115	32x4	1945	1795	1995	2895	2895
Comet C-53	Cont	6-3½x5¼	125	33x4½	....	2350	2450	....	3650
Commonwealth 44	H-S	4-3½x5	117	32x4	....	1595	....	....	2465
Crawford 21-6-40	Cont	6-3½x5¼	122½	32x4	3000	3000	....	....	4500
Crow-Elkhart L63-65	Lyc	4-3½x5	117	32x3½	‡1295	1295	....	....	....
Crow-Elkhart S63-65	H-S	6-3¼x5	117	33x4	†1545	1545	....	....	2395
Cunningham V-4	Own	8-3⅝x5	132	35x5	....	....	....	....	....
Daniels D-19	Own	8-3½x5½	132	34x4½	‡5350	†5350	5350	6250	6950
Davis 51-57	Cont	6-3¼x4½	120	33x4	†1995	1895	†2150	2795	2795
Dispatch	....	4-3¼x5	120	34x4	1290	1350	1350	1525	1575
Dixie Flyer H-S-70	H-S	4-3½x5	112	32x4	1595	1595	....	2570	2570
Dodge Brothers	Own	4-3⅞x4½	114	32x3½	1235	1285	....	1900	2150
Dorris 6-80	Own	6-4 x5	132	33x5	....	†4785	4785	5800	6690
Dort 17-A	D-Ly	4-3½x5	108	31x4	1215	1215	....	1865	1995
Dupont A	Own	4-3½x5½	124	32x4½	3400	†3400	....	....	4900
Elcar 7-R	Cont	6-3¼x4½	117	33x4	‡1795	1795	†1795	2500	2600
Elgin K-1	Falls	6-3¼x4¼	118	33x4	†1895	1775	....	2795	2795
Essex	Own	4-3⅝x5	108½	32x4	1595	1595	....	2100	2450
Fergus S-5-21	Own	3½x5	126	32x4½	....	(	Chassi	a Price	8500
Ferris	Cont	6-3½x5¼	130	32x4½	3350	....	....	*3350	....
Ford T	Own	4-3⅜x4	100	30x3½	395	440	....	745	795
Franklin 9-B	Own	6-3¼x4	115	32x4	2700	2800	†2750	2950	3850
Friend Four	Own	4-3¼x4½	112	32x3½	1285	1285	....	1985	2085
Globe B-10	Supre	4-3⅝x5	115	32x4	....	....	....	....	....
Grant Six	Own	6-3½x4½	116	32x4	1550	1550	....	2450	2450
Gardner G	Lyc	4-3½x5	112	32x3½	‡1195	1195	....	....	2145
Halladay 21	Rut	6-3⅛x5	116	33x4	....	2285	....	....	....
Handley-Knight	Kn'ht	4-4½x4½	125	32x4½	....	....	2985	....	4185
Hanson Six 60	Cont	6-3¼x4½	121	32x4	2185	2185	†2285	....	3165
Harroun A-A-2	Own	3½x5½	106	30x3½	....	1195	....	....	....
Hatfield A-42	H-S	4-3½x5	115	32x4	1695	1695	....	....	2595
Haynes 47	Own	6-3½x5	132	34x4½	3500	†2935	2935	....	4250
Haynes 50	Own	6-3½x5	121	33x4	....	1985	....	....	....
Haynes 48	Own	12-2⅝x5	132	34x4½	4200	†3635	3635	....	4950
Huffman R	Cont	6-3¼x4½	120	32x4	1795	1795	....	....	2775
H.C.S Series 3	Weid	4-3⅝x5½	120	32x4½	2925	†2975	....	3650	....
Helmes Series 4	Own	6-3½x4¼	126	34x4½	†3350	....	3350	4250	4550
Hudson Super 6	Own	6-3½x5	126	34x4½	†2400	....	2400	3275	3400
Hupmobile Series R	Own	4-3¼x5½	112	32x4	1685	1685	....	2725	2800
Jackson 638	Cont	6-3¼x4½	121	32x4½	†2685	1950	....	3760	3760
Jordon M	Cont	6-3¼x4½	120	32x4	2650	2650	2875	3700	3700
Kelsey GF	Own	6-3⅛x4¼	116	32x4	1800	1800	....	2700	2700
Kenworthy 8-90	Own	8-3 x5¼	130	32x4½	5000	5000	5250	6000	6000
Kessler K	Own	4-3¾x3¾	117	32x4	....	1995	....	....	2445
King H	Own	8-3 x5	120	32x4½	2740	†2725	*2725	....	4035
Kissel 45	Own	6-3⅞x5½	124	32x4½	3475	†3475	2775	4275	4275
Kline Kar 6-55-K	Cont	6-3¼x4½	121	33x4	2290	2290	2290	3250	3200
Kurtz Automatic A	H-S	6-3¼x5	122	32x4	....	2250	....	....	3000
LaFayette 134	Own	8-3½x5¼	132	33x5	....	5625	5625	7200	7400
Leach 21-A-B &C	Cont	6-3½x5¼	128	32x4½	‡5700	5200	5700	....	....
Lexington Series S	Cont	6-3¼x4½	122	32x4	†2285	2285	....	3250	2785
Lexington Series T	Anst	6-3¼x4½	128	32x4½	....	....	2985	4150	4250
Liberty 10-C	Owned	6-3½x5	117	32x4	1795	1795	†1885	2825	2850
Lincoln	Own	8-3⅜x5	130	33x5	4600	4600	4600	5750	6000
Locomobile	Own	6-4½x5½	142	35x5	....	†8600	8600	....	....
Lone Star	Lyc	4	....	....	....	....	....	....	....
Lorraine 21-T	H-S	4-3½x5	114	32x4	1665	1665	....	2590	2590
Maibohm B	Own	6-3⅛x4¼	116	32x4	‡1575	1575	†1750	2395	2395
Marmon 34	Own	6-3¾x5½	130	32x4½	5300	†5000	5000	6150	6600

NAME AND MODEL	Engine Make	Cylinders: Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Maxwell 25	Own	4-3⅝x4½	109	30x3½	$ 995	$ 995	....	$1595	$1695
McFarlan 1921	Own	6-4½x6	140	33x5	6300	†6300	$6300	7500	7500
Mercer Series 5	Own	4-3¾x6¾	132	32x4½	4500	†4500	*4500	5700	6200
Merit	Cont	6-3½x4½	119	32x4	2245	†2245	....	....	....
Meteor R&RR	Dues	4-4½x6	129	32x4½	5500	5500	....	....	....
Metz M6	Rut	6-3½x5	120	32x4	1995	1995	....	2795	2895
Mitchell F-40	Own	6-3¼x5	120	33x4	‡1750	1750	†1950	2800	2900
Mitchell F-42	Own	6-3½x5	127	33x4	....	....	1995	....	....
Moller A	Own	4-2¾x4	100	27x3½	2000	....	....	....	....
Monitor B50-52	Cont	6-3½x4½	121	33x4	....	....	....	....	....
Monroe S-9 & 10	Own	4-3¼x4½	115	32x3½	1440	1440	....	....	....
Monroe S-11 & 12	Own	4-3¼x4½	115	33x4	....	....	....	2400	2500
Moon 6-48	Cont	6-3¼x4½	122	32x4	2285	2185	2685	3185	3185
Murray-Mac Six	Own	6-3½x5¼	128	34x4½	4250	4250	4250	....	....
Nash 681-7	Own	6-3¼x5	121	33x4	1695	1695	†1850	2650	2895
Nash 682	Own	6-3¼x5	127	34x4½	....	....	1875	....	....
Nash Four 41-4	Own	4-3¼x5	112	32x3½	1395	1395	....	1985	2185
National Sextet BB	Own	6-3½x5¼	130	32x4½	3750	†3750	3750	4900	4950
Nelson D	Own	4-3½x4¾	104	32x4	....	1900	....	....	....
Noma 1C	Cont	6-3¼x4½	128	32x4½	3000	3200	....	....	4450
Northway	Own	6-3½x5¼	128	33x5	4200	*4200	6000	5600	5400
Norwalk 430-KS	Lyc	4-3½x5	116	32x3½	. .	1285	....	....	....
Oakland 34-C	Own	6-2½x4¾	115	32x4	1395	1395	....	2065	2065
Ogren 6-60	Own	6-3½x5¼	134	33x5	3850	3500	3900	5000	5400
Oldsmobile 43-A	Own	4-3½x5¼	115	32x4	†1445	1445	....	2145	2145
Oldsmobile 37A	Own	6-2½x4¾	112	32x4	†1450	1450	....	2145	2145
Oldsmobile 46	Own	8-2⅞x4¾	122	33x4½	....	†2100	2100	....	3300
Oldsmobile 47	Own	8-2⅞x4½	. .	32x4	. . .	†1695	....	2395	2395
Overland 4	Own	4-3⅜x4	100	30x3½	895	895	....	1425	1475
Packard Single-Six	Own	6-3⅜x4½	116	33x4½	2975	2975	....	4150	4250
Packard Twin Six	Own	12-3 x5	136	35x5	6000	*6000	6000	8200	8450
Paige 6-42	Own	6-3½x5	119	32x4	1795	1795	....	2600	2720
Paige 6-66	Cont	6-3⅜x5	131	33x4½	†2995	....	2895	3775	3850
Pan A	Own	4-3½x5	108	33x4	....	1500	....	....	....
Pan American E&F-6-55	H-S	6-3½x5	121	33x4	2250	2250	....	....	....
Parenti 1921	Own	8-2¾x4¼	125	32x4	....	2000	....	....	3000
Paterson 650	Cont	6-3¼x4½	120	33x4	....	1895	1925	2895	2895
Peerless 56-S-7	Own	8-3½x5	125	34x4½	....	†2990	2990	3680	3950
Peters	Own	2-3½x3⅜	90	28x3	385	....	....	....	....
Piedmont 4-30	Lyc	4-3½x5	116	32x3½	....	1395	....	....	....
Piedmont 6-40	Cont	6-3¼x4½	122	32x4	....	1795	....	....	....
Pierce-Arrow	Own	6-4 x5½	138	35x5	8000	†7500	7500	8500	9000
Pilot 6-50	H-S	6-3¼x5	126	32x4½	2285	2285	2335	3600	3600
Porter 40	Own	4-4.6x6¾	142	35x5	6750	Chassi	a Price	....	....
Premier 6-D	Own	6-3⅜x5½	126¾	33x5	4600	†4600	4600	5600	6100
Premocar 6-40 A	Falls	6-3¼x4¼	117	32x3½	....	1295	....	....	....
Premocar 4-80	Dues	4-4 x6	117	32x4½	....	3865	....	....	....
Raleigh A-6-60	H-S	6-3¼x5	122	32x4½	‡2750	2750	....	3600	3700
Ranger A-20	Own	4-3⅜x5	116	32x4	....	....	....	....	....
R & V Knight R	Own	4-3⅜x5	116	32x4	....	2150	....	2850	2950
R & V Knight J	Own	6-3½x4½	127	32x4½	3350	†3350	3350	4000	4200
Reo T-6	Own	6-3½x5	120	33x4	1850	1850	....	2700	2750
Revere C	Dues	4-3⅜x6	131	32x4½	4850	4650	†4650	....	6500
Roamer 6-54-E	Cont	6-3½x5¼	130	32x4½	....	....	....	....	....
Romer	Cont	6-3¼x4½	120	32x4	....	....	....	....	....
Rock Falls 14000	Cont	6-3½x5¼	136	35x5	....	....	....	....	....
Rolls-Royce	Own	6-4½x4¾	143½	33x5	11,500	Chassi	s Price	....	....
Saxon 125	Own	4-3⅜x5	112	32x4	....	1675	....	2475	2475
Sayers Six DP	Cont	6-3¼x4½	118	33x4	2495	2195	....	....	3295
Scripps-Booth B-39-42	Nort	6-2½x4¾	115	32x4	‡1545	1545	....	2215	2295
Seneca L & O	LeR	4-3½x4½	108	30x3½	1185	1185	....	....	....
Severin Six	Cont	6	....	33x4	1485	1485	....	2100	2250
Severin Six	Cont	6-3½x5¼	122	33x5	2550	2550	2550	3250	3350
Sheridan 4	Nort	4-3½x5¼	116	33x4	1685	1685	....	2565	2765
Sheridan 8	Nort	8-3½x4½	132	33x5	....	....	....	....	....
Skelton 35	Lyc	4-3½x5	112	32x3½	1295	1295	....	....	....
Southern Six 660-2	H-S	3½x5	127	32x4½	2875	2875	2995	....	....
Standard J	Own	8-3¼x5	127	34x3½	3400	†3400	3400	4500	4500
Stanley Steamer	Own	2-4 x5	130	34x4½	....	3950	3950	5650	5775
Stanwood Six	Cont	6-3¼x4½	118	33x4	2050	2050	....	2950	2950
Stearns SKL4	Own	4-3⅜x5⅝	125	34x4½	2550	2450	2675	3400	3700
Stephens 90	Own	6-3¼x4½	122	33x4½	2400	†2400	2400	3400	3400
Stevens Duryea E	Own	6-4⅞x5½	138	35x5	8500	†8000	8000	9500	9500
Studebaker EJ-40	Own	6-3⅛x4½	112	32x4	®1650	1485	....	....	2150
Studebaker EH-50	Own	6-3½x5	119	32x4	1750	1750	†1750	2650	2750
Studebaker EG-60	Own	6-3⅞x5	126	33x4½	....	....	2150	....	....
Stutz H & K	Own	4-3⅝x6	130	32x4½	3900	†4000	*4000	5500	....
Templar A-445	Own	4-3⅜x5½	118	32x4	2885	2885	†2885	3785	3785
Texan A-38	Lyc	4-3½x5	115	33x4	1195	1195	....	....	....
Texan C-12	H-S	4-3½x5	115	33x4	1650	1650	....	....	....
Tulsa E-1-2-3	H-S	4-3½x5	117½	33x4	1385	1385	....	....	....
Velie 48	Cont	6-3¼x4½	115	32x4	1885	1885	†2200	2885	2885
Velie 34	Falls	6-3½x4¼	112	32x3½	1485	1485	....	....	2485
Vogue 6-55	H-S	6-3¼x5	124	32x4	....	2285	2360	3050	30 0
Vogue 6-66	Cont	6-3½x5¼	124	33x4½	....	2485	2560	3250	3250
Washington	Own	6-3½x4½	114	32x4	....	1685	....	....	....
Wasp 2611	Wisc	4-4¾x5½	132	33x5	....	†6500	....	....	....
Westcott C-48	Cont	6-3½x5¼	125	32x4½	....	2990	2990	....	4590
Westcott C-38	Cont	6-3¼x4½	118	33x4	2290	2290	....	3390	3390
Wharton A	Curt	8-4 x5	136	34x4½	....	†4885	4885	....	....
Wills-Sainte Claire	Own	8-3¼x4	121	32x4½	5500	3500	....	....	....
Willys-Knight 20	Own	4-3⅝x4½	118	33x4	2195	2195	....	2845	2945
Winther 61	H-S	6-3¼x5	120	33x4	....	....	....	....	....
Winton 25	Own	6-3¾x5½	132	35x5	4600	†4975	4600	5950	†5950

*—6-passenger. †—4-passenger. ‡—3-passenger. ®—Special Body.

Engine Make: Cont—Continental. D.Ly—Dort Lycoming. Dues.—Duesenberg. GBS—Golden, Belknap & Swartz. H-S—Herschell-Spillman. Lyc—Lycoming. Nort—Northway. Rut—Rutenber. Tee—Teetor. Wal—Walther. Wisc—Wisconsin. Weid—Weidely. LeR—Leroi. Curt—Curtiss. §—Model 47—34x4½ Tires.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason, R	1	$2260	3¾x5½	36x3½	36x5	W
Acason, RB	1½	2485	3¾x5½	36x3½	36x6	W
Acason, H	2½	3295	4⅝x5⅝	36x4*	36x4d*	W
Acason, L	3½	4295	4⅝x5⅝	36x5*	36x5d*	W
Acason, M	5	5250	5 x6¼	36x6	40x12	W
Ace, C	1½	2750	3¾x5½	34x3½*	34x5*	W
Ace, A	2½	3450	4¼x5½	36x4*	36x7	W
Ace	3	3650	4¼x5½	36x6	36x8	W
Acme, B	1	2175	3¾x5	34x3½	34x5	W
Acme, F	1½	2475	3¾x5	34x3½	34x5	W
Acme, A	2	3050	4½x5¼	36x4	36x7	W
Acme, C	3½	4050	4½x5½	36x5	40x10	W
Acme, E	5	5150	4¾x6	36x6	40x12	W
Acme, G	¾	1790	3¾x5	35x5†	35x5†	W
Akr'nMulti-Trk	20	2485§	4 x5¼	34x5	34x5	B
All-Power, C	3½	5800	4½x6	36x7	36x10	W
All-American, B-1	1½	1795	3½x5	32x4	32x4	I
All-American C-1	1½	2195	3½x5	34x4	34x5	I
American, 25	2½	3575	4 x6	36x4*	36x4d*	W
American, 40	4	4575	4½x6	36x5*	36x5d*	W
Apex, G	1	1675	3¾x5	33x5†	33x5†	I
Apex, D	1½	1915	3¾x5¼	34x3½	34x4	I
Apex, E	2½	2695	4¼x5½	36x4	36x7	I
Apex, F	3½	3975	4½x6	36x5	36x10	I
Armleder, HW	2½	....	4¼x5½	36x4*	36x7*	W
Armleder, KW	3½	....	4½x6	36x5	36x5d	W
Armleder, 20	1	....	3¾x5¼	34x3½*	34x5*	W
Atco, B	1½	....	3¾x5¼	34x5†	36x6*	I
Atco, B1	1½	....	3¾x5¼	34x5†	36x6†	I
Atco, A	2½	....	4¼x5½	36x4†	36x8*	W
Atlas, M.D	1	....	3½x5	32x4½†	32x4½†	W
Atterbury, 20R	1½	2775	3¾x5	34x3½	34x5	W
Atterbury, 7CX	2½	3375	4¼x5¼	36x4	36x4d	W
Atterbury, 7D	3½	4175	4½x5½	36x5	40x5d	W
Atterbury, 8E	5	5575	4¾x6	36x5	40x6d	W
Autocar, 21UF	1½-2	2300	4¾x4½*	34x4*	34x5*	D
Autocar, 21UG	1½-2	2400	4¾x4½*	34x4*	34x5*	D
Autocar, 26Y	....	4350	4¼x5½	34x5	36x10	D
Autocar, 26-E	....	4500	4¼x5½	34x5	36x10	D
Available, H1½	1½	2750	4 x5⅛	36x3½*	36x5*	W
Available, H2½	2½	3475	4 x5⅛	36x4*	36x8*	W
Available, H3½	3½	4475	4½x5½	36x5	40x5d	W
Available, H5	5	5375	4¾x6	36x6	40x12	W
Available, H7	7	6000	5 x6	36x6	40x14	B
Avery	1	....	3 x4	34x5†	34x5†	I
Beck, A. Jr.	1	1800	3¾x5	34x3½	34x4	I
Beck, C	2	2550	4½x5½	36x4	36x6	I
Bell, O	2½	2750	4½x5½	34x4	34x7	I
Bell, E	1½	2250	3¼x5¼	34x3½	34x5†	I
Belmont, E	2	2195	3¾x5	34x3½*	34x6*	D
Belmont, D	3½	3195	4 x6	36x5*	36x5d*	D
Bessemer, G	1	1700	3½x5	35x5†	35x5†	I
Bessemer, H-2	1½	2445	3¾x5	36x3½	36x5	I
Bessemer, J-2	2½	3285	4¼x5¼	36x4	36x4	I
Bessemer, K-2	4	4485	4½x5½	36x6	36x10	I
Bethlehem, K	1	1695	3½x5	34x4½†	35x5	I
Bethlehem, G	2	2725	4 x5¼	34x3½*	34x6*	I
Bethlehem, H	3	3250	4 x5½	36x4*	36x8	I
Bethlehem, J	4	4195	4½x5½	36x5*	36x5d*	I
Bollstrom, 30	1½	2100	3¾x5¼	34x3½	34x6	I
Bollstrom, 50	2½	2800	4¼x5½	36x4	36x8	I
Bollstrom, 70	3½	3800	4½x6	36x5	36x10	I
Bollstrom, A-20	4	6000	5¾x7	40x8†	40x8†	I
Bollstrom, B21	4	5050	4½x5½	36x7	36x7	I
Bridgeport, A	1½	2350	3¾x5¼	34x3	34x6	W
Bridgeport, B	2½	2850	4¼x5½	36x4*	36x7*	W
Bridgeport, C	4	3650	4½x6	36x5	36x5d	W
Bridgeport, D	6	4500	4½x6	36x6	36x6d	W
Brinton, F	2½	3400	4½x5¼	36x4	36x7	W
Brockway, E	¾	1675	3¾x5	35x5†	35x5†	B
Brockway, S-4	1½	2250	3¾x5	36x3½*	36x5*	W
Brockway, K-5	2½	3200	4½x5½	36x4	36x7	W
Brockway, R-4	3½	4100	4½x5½	36x5	36x5d	W
Brockway, T	5	5250	4¾x6	36x6	40x6d	W
Case, ††	2	3000	4½x5¾	36x6	38x7	I
Capitol, G1½	1½	2975	3¾x5	35x5	38x7	W
Capitol, H2½	2½	3700	4¼x6	36x4	36x8	W
Capitol, K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol, M3½	3½	4425	4¼x6	36x5	36x10	W
Champion Light Commercial	1½	1100	3½x5	32x3½	32x3½	I
Chevrolet, G	¾	920	3½x4	31x4†	34x4½†	B
Chevrolet, T	1	1325	3½x5¼	33x4†	35x5†	W
Chicago, C1½	1½	....	3¾x5½	36x3½*	36x5*	W
Chicago, C2½	2½	....	4 x5⅛	36x4*	36x7*	W
Chicago, C3½	3½	....	4½x5½	36x5	36x10	W
Chicago, D5	5	....	4½x5½	36x6	40x12	W
Climber, A	20 1½	2450	3½x5	36x6*	38x7*	I
Clydesdale, 32C	1	2375	4¾x5	34x3½*	34x5*	W
Clydesdale, 42C	1½	2750	4¾x5	36x3½	36x5	W
Clydesdale, 65C	2½	3540	4½x5½	36x4	36x7	W
Clydesdale, 65EC	2½	3775	4½x5½	36x4	36x7	W
Clydesdale, 90C	3½	4400	4½x5½	36x5	40x10	W
Clydesdale, 120C	5	5500	4¾x6	36x6	40x12	W
Collier, 18	1	....	3¾x5	34x4	34x5	W
Collier, 19	1½	....	3¾x5	36x4	36x6	W
Collier, 21	2	....	4½x5¼	36x4	36x7	W
Collier, 22	2½	....	4½x5¼	36x4	36x4	W
Columbia, H	1½	2350	3¾x5	35x5†	34x5	I
Columbia, G	2½	2850	4 x5¼	36x4	36x7	I
Comet	1½	....	3¾x5	34x4	34x4	W
Commerce, T	¾	1450	3¾x5	34x4½†	34x4½†	B
Commerce, 12	1½	1800	3¾x5	35x5†	35x5†	I
Commerce, 16	2	2150	3¾x5	35x5†	35x6†	I
Concord, A	1½	2700	4 x5½	36x3½	36x6	W
Concord, B	2½	3600	4¼x5½	36x4	36x8	W
Concord, AX	1½	2950	4 x5½	36x3½	36x6	W
Concord, BX	2½	3600	4½x5½	36x4	36x8	W
Cook, 41	2	3000	4 x5½	36x6†	38x7†	I
Corbitt, E	1	2400	3¾x5	34x3½	34x4	W
Corbitt, D	1½	2800	3¾x5	36x3½	36x5	W
Corbitt, C	2	3500	4¼x5¼	36x3½	36x7	W
Corbitt, B	2½	3650	4½x5¼	36x4	36x7	W
Corbitt, A	3½	$4500	4½x5½	36x5	36x10	W
Corbitt, AA	5	5500	4¾x6	36x6	40x6d	W
Cyclone	1½	2800	3½x5	34x5†	36x6†	I
Dart, S	1½	....	3¾x5½	34x3½	34x6	W
Dart, M	2½	....	4¼x5½	36x4	36x7	W
Dart, W	3½	....	4½x6	36x5	36x10	W
Day-Elder, A	1	2225	3¾x5	34x3½	34x4	W
Day-Elder, B	1½	2425	3¾x5	34x3½	34x5	W
Day-Elder, D	2	2900	4½x5¼	36x4*	36x7	W
Day-Elder, C	2½	3125	4¼x5	36x4	36x7*	W
Day-Elder, F	3½	3950	4½x5½	36x5*	36x5d*	W
Day-Elder, E	5	4875	4½x6	36x5	36x6d	W
Dearborn, F	1½	2180	3¾x5½	34x4*	34x5*	W
Dearborn, 48	2	2590	3¾x5½	35x5†	34x7†	W
Defiance, D	1½	2550	3¾x5	35x5†	36x6†	I
Defiance, E	2	2750	3¾x5	35x5†	38x7†	I
DeKalb, E2	2½	2250	4½x5¼	34x3½*	36x5*	W
DeKalb, E2½	2	2600	4½x5¼	36x4*	36x6*	W
DeMartini 1½	1½	2600	3¾x5	34x3½	34x6	W
DeMartini 2	2	3300	4 x5½	36x3½	36x7	W
DeMartini 3	3	4250	4¼x5½	36x4	36x10	W
DeMartini 4	4	4800	4½x6	36x5	36x12	W
Denby, 33	1½	2300	3¾x5	35x5†	38x7†	I
Denby, 134	2	2800	3¾x5	36x3½	36x6	I
Denby, 25	3	3600	4½x5¼	36x4	36x7	I
Denby, 27	4	4600	4½x5½	36x5	36x5d	I
Denby, 210	5	5350	4½x5½	36x6	40x6d	I
Dependable, A	¾-1	1650	3½x5	34x5	36x6	W
Dependable, C	1½	2350	3¾x5¼	34x3½	34x5	W
Dependable, D	2	2650	4 x5½	34x5	36x6	W
Dependable, E	2½	2950	4¼x5½	36x4	36x7	W
Dependable, G	3½	3350	4½x6	36x6	38x7	W
Diamond T, O	1	2500	3¾x5¼	34x5†	36x6†	W
Diamond T, FS	1½	2960	.....	36x3½	36x5	W
Diamond-T, T	1½	2650	3¾x5¼	36x3½	36x5	W
Diamond-T, U	2	3285	4 x5¼	36x4	36x7	W
Diamond-T, K	3½	4675	4¼x5½	36x5	36x5d	W
Diamond-T, EL	5	5400	4½x5½	36x6	40x6d	W
Diamond-T, S	5	5650	4¾x6	36x6	40x6d	W
Diehl, A	1	....	3½x5	34x4½	35x5	I
Diehl, B	1½	....	3½x5	36x6	36x6	I
Dispatch, F	1	1350	3¾x5	34x4†	34x4†	I
Doane	2½	4100††	4¼x5¾	36x5	36x7	C
Doane	3½	5100††	4½x5¾	36x5	36x5d	C
Doane	6	6000††	4¾x6¾	36x6	40x6d	C
Dodge Brothers	½	1085	3⅞x4½	33x4†	33x4†	B
Dorris, K-4	2	3400	4¼x5½	36x4	36x7	W
Dorris, K-7	3½	4400	4½x5½	36x5	36x10	W
Double Drive C	1½	2800	3¾x5½	5	4	W
Double Drive B	3	4000	4¼x5½	6	6	W
Douglas G	1½	2050	3¾x5⅛	36x5*	37x8*	W
Douglas I	3	3250	4¼x5½	36x6*	37x8*	W
Duplex, A	1½	2775	4 x5¼	35x5†	38x7†	W
Duplex, E	3½	4250	4½x5½	36x8	36x8	I
Duty, 21	2	1490	3½x5	34x3½	34x5	I
Eagle, 100-2	2	2275	3¾x5¼	34x3½*	34x6*	I
Erie, A	2½	....	4¼x5½	36x4	36x4d	W
Facto, 1921	2½	2895	4¼x5½	36x4*	36x8*	W
Fageol, (Cal.)	1½	3000	3¾x5¼	34x3½*	34x6*	W
Fageol, (Cal.)	2½	3900	4¼x5¾	34x4	36x7	W
Fageol (Ohio) Md	2½	3900	4½x5¾	36x4*	36x4*	W
Fageol (Ohio) Hd	3½	5000	4½x6¼	36x5*	40x5d*	W
Fageol, (Cal.)	3½	5000	4½x6¼	36x5	36x5d	W
Fageol, (Cal.)	5	5700	4½x6¼	36x6	40x6d	W
Famous, B10	1	1800	3½x5	36x2½	36x4	I
Famous, B12	1½	2100	3¾x5	36x3½	36x5	I
Fargo, R	2	2500	3¾x5	36x4	36x6	I
Federal, SD	1	2500	3¾x5	35x5†	36x6†	W
Federal, TE	1½	2725	4½x5¼	36x3½	36x5	W
Federal, UE	2	3025	4½x5¼	36x4	36x7	W
Federal, WE	3½	3950	4½x5½	36x5	36x5d	W
Federal, X2	5	5350	4½x5½	36x6	40x6d	W
Ford, TT	1	545	3¾x4	30x3½*	32x4½*	W
Forschler, A	1	....	3½x5	36x3	36x4	W
Forschler, AX	1½	....	3½x5	36x3½	36x5	W
Forschler, B	2	....	4½x5¼	36x4	36x7	W
Forschler, BX	3	3450	4½x5¼	36x4	36x8	W
F.W.D., B	3	4200	4¾x5½	36x6	36x6	B
Fulton, A	¾	1750	3½x5	35x5†	35x5†	B
Fulton, C	2	2350	3½x5	34x4	34x6	I
Garford, 25	1¼	2090	3¾x5½	36x3½	36x4	W
Garford, 70-H	2	3190	4½x5¼	36x4	36x7	W
Garford, 68D	5	5200	5 x6½	36x6	40x6d	W
Garford, 77D	3½	4390	4½x6	36x5	36x6d	W
Garford, 150-A	7½	5500	5x6½	36x6	40x7d	C
Gary, F	1	2100	3¾x5	36x3½	36x4	W
Gary, I	1½	2550	4½x5½	35x5†	38x7†	W
Gary, J	2½	3150	4¼x5½	36x6*	40x8*	W
Gary, K	3½	4050	4½x6	36x5	40x5d	W
Gary, M	5	5150	5 x6½	36x6	40x6d	W
G.M.C., 16	¾	....	3¾x5	35x5†	35x5†	B
G.M.C., 31	1½	....	3¾x5	36x3½	36x5	W
G.M.C., 41	2	....	4½x5¼	36x4	36x7	W
G.M.C., 71	3½	....	4½x5½	36x5	40x5d	W
G.M.C., 101	5	....	4½x5½	36x6	40x6d	W
Gersix M	1½	3100	4 x5½	36x3½	36x7	W
Gersix K	2½	3500	4½x5½	36x4	36x8	W
Gersix	3½	4500	4½x6	36x5	40x12	W
Giant, 15-A	1½	2425	3¾x5	34x3½	34x5	W
Giant, 16	2	3250	4½x5¼	36x4	36x7	W
Giant, 17	3½	4150	4½x5½	36x5	36x5d	W
Golden West, G	3½	4500	4½x5½	36x6	36x6	W
Golden West, H	3½-4	5000	4½x6	36x6	36x6	W
Golden West, HA	7	6000	4½x6	36x6	36x10	W
Golden West, GH	3	4500	4½x6	36x6	36x6	W
Golden West, T	4	5500	4¾x6	36x6	36x6	W
Golden West, K	7	6000	5½x6	36x6	36x6	W
Gove, A1	2½	....	4½x5¼	36x4*	36x7*	I
Graham Bros. A	1½	2495	3¾x5	35x5†	36x6†	I
Gramm-Bern., 10	1	1495§	3½x5	33x5†	33x5†	B
Gramm-Bern., 15	1½	2050§	3¾x5	36x3½*	36x5*	I
Gramm-Bern., 65	1½	2725§	3¾x5	36x3½*	36x5	W
Gramm-Bern., 20	2	3175§	4½x5¼	36x4*	36x7*	W
Gramm-Bern., 25	2½	$3575§	4½x5½	36x4*	36x4d*	W
Gramm-Bern., 35	3½	4375§	4½x5½	36x5	40x5d*	W
Gramm-Bern., 50	5	5275§	4¾x6	36x6	40x6d*	W
G.W.W.	1½	2100	3¾x5½	35x5	35x5	I
Hahn, J4	1	....	3¾x5	34x5*	34x5*	W
Hahn, CD	1½	....	4½x5¼	35x3½*	36x6*	W
Hahn, EE	2½	....	4½x5½	36x4*	36x8*	W
Hahn, F	3½	....	4½x5½	36x5*	36x10	W
Hahn, EF	5	....	4¾x6	36x6	40x12	W
Hal Fur, E	1	2350	4 x5	35x5†	35x5†	W
Hal Fur, B	2½	3250	4¼x5½	35x5*	38x7*	W
Hal Fur, F	3½	4250	4½x5½	36x6†	40x10†	W
Hall	1½	3100	3¾x5	34x5†	38x7†	W
Hall	2½	3275	4½x5¼	36x4	36x6	W
Hall	3½	4100	4½x5½	36x5	36x5d	W
Hall	5	5100	4½x5½	36x5	40x6d	W
Hall	7	5100	4½x5½	36x5	40x6d	C
Harvey, WEA	1½	2550	4½x5½	34x3½	34x5	W
Harvey, WFA	2½	3300	4¼x5½	36x4	36x7	W
Harvey, WHA	3½	4300	4½x6	36x5	36x5d	W
Harvey, WKA	5	5200	4½x6	36x6	40x6d	W
Hawkeye, K	1½	2365	3¾x5¼	34x3½*	34x5*	I
Hawkeye, M	2	2915	4¼x5½	36x4*	36x6*	I
Hawkeye, N	3½	4345	4½x6	36x5*	36x10*	I
Hendrickson, K	5	4800	.....	.....	.....	..
Hendrickson, N	2½	3150	4¼x5¾	36x4*	36x7*	W
Hendrickson, M	3½	3975	4¼x5¾	36x5*	36x5d*	W
Highway, A410	4	....	4 x6	36x5	36x6d	W
Highway, B510	5	....	4 x6	36x5	40x6d	W
Higrade, A17	¾	1850	3½x5	32x4½	32x4½	W
Higrade, A18	1	2100	3½x5	35x5†	35x5†	W
Higrade, B20	1½	2500	4¼x5¼	35x4†	36x6†	W
Huffman, B	1½	1995	3¾x5	34x3½	34x6	W
Huffman, C	1½	1795	3¾x5½	34x3½	34x6	I
Hurlburt	1½	....	4 x5½	34x4	34x5	W
Hurlburt	2½	....	4¼x5½	36x4	36x4d	W
Hurlburt	3½	....	4½x6	36x5	36x5d	W
Hurlburt	5	....	4½x6	36x5	40x6d	W
Huron Erie	1½	2425	3¾x5¼	36x3½	36x5	I
Huron Mich.	2½	2950	4¼x5½	36x4	36x7	W
Indep'd't(Iowa),G	1½	2040	3¾x5½	34x3½	34x5	I
Indep'd't(Ia.),H.F.	2½	2940	4½x5¼	34x4	34x6	I
Indep'd't(Iowa), B	1	1665	3½x5	34x3½	34x4	W
Indep't'd(Ohio), F	1½	2585	3¾x5	36x3½	36x5	W
Indep't'd(Ohio) H	2½	3285	4½x5½	36x4	36x4d	W
Indep'd't(Ohio) K	3½	4285	4½x5½	36x5	36x5d	W
Indiana, 12	1¼	....	3¾x5¼	34x3½*	34x5*	W
Indiana, 20	2	....	4½x5½	36x4*	36x7*	W
Indiana, 25	2½	....	4½x5½	36x4*	36x8*	W
Indiana, 35	3½	....	4½x5½	36x5*	36x5d*	W
Indiana, 51	5	....	5 x6¼	36x5*	40x6d*	W
Inland, D	2	2950	4 x5	34x5	34x6	I
International, 21	1	1850	3½x5¼	36x3½	36x3½	I
International, S	¾	1500	3½x5	34x5†	34x5†	I
International, 31	1½	2050	3½x5¼	36x3½	36x4	I
International, 41	2	2400	3½x5¼	36x3½	36x5	I
International, 61	3	2800	4¼x5	36x4*	36x6*	I
International, 101	5	4500	4¼x5	36x5	40x10	I
Jackson, 4WD	3½	4550	4½x5½	36x7	36x7	B
Jumbo, 15	1½	2425	3¾x5½	36x3½	36x5	I
Jumbo, 20	2	2675	3¾x5½	35x5†	38x7†	I
Jumbo, 25	2½	3090	3¾x5½	36x4	36x7	I
Jumbo, 30	3	3590	4¼x5½	36x6†	42x9†	I
Jumbo, 35	3½	4080	4½x6	36x5	36x10†	I
Jumbo, 40	4	4730	4 x6	38x7†	44x10	I
J & J, D	2	3250	4 x5	34x4*	34x6	I
Kalamazoo, G-1	1½	2800	3¾x5	34x4	34x5	W
Kalamazoo, G-2	1½-2	3100	3¾x5	36x4*	36x5*	W
Kalamazoo, H	2½	3700	4 x6	36x4	36x8	W
Kalamazoo, K	3½	4300	4½x6	36x5	36x10	W
Karavan, A	2½	....	4¼x6	36x4	36x8	W
Kearns, H	¾	1600	3¼x4½	32x4½†	32x4½†	I
Kearns, N	1½	2200	3½x5	34x3½	34x6	I
Kelly-S, K-31	1½	2900	3¾x5¼	36x3½	36x6	C
Kelly-S, K-35	2½	3250	3¾x5¼	36x4	36x4d	C
Kelly-S., K-34	1½	2900	3¾x5¼	36x3½	36x6	W
Kelly-S., K-36	2½	3250	3¾x5¼	36x4	36x4d	W
Kelly-S., K-40	3½	4200	4½x6½	36x5	40x5d	C
Kelly-S., K-50	5	4900	4½x6½	36x6	40x6d	C
Kelly-S., K-60	6	5100	4½x6½	36x6	40x7d	C
Kelly-S., K-41	3½	4200	4½x6½	36x5	40x5d	I
Kelly-S., K-42	3½	4200	4½x6½	36x5	40x5d	W
Kelly-Springfield K-45	4	4550	4½x6½	36x5	40x6d	C
Keystone, 40	2	2450	3¾x5⅛	34x5†	38x7†	I
Kimball, AB	2	3675	4 x6	36x4	36x7	W
Kimball, AC	2½	3975	4¼x6	36x4	36x8	W
Kimball, AK	3	4500	4½x6	36x4	36x10	W
Kimball, AE	4	5000	4¾x6	36x5	40x10	W
Kimball, AF	5	5975	5 x6	36x6	40x12	W
Kissel, Express	1	1985††	3½x5½	34x5†	34x5†	W
Kissel, Utility	1½	2775	3½x5½	36x3½	36x5	W
Kissel, Freighter	2½	3475	4¼x5½	36x4	36x7	W
Kissel, H. D.	4	4475	4½x5½	36x5	36x5d	W
Kleiber, AA	1	2600	4½x5¼	34x3½*	34x5*	W
Kleiber, A	1½	3100	4½x5¼	36x3½*	36x6*	W
Kleiber, A	1½	3100	4½x5¼	36x3½*	36x6*	W
Kleiber, BB	2	4000	4½x5¼	36x4*	36x7*	W
Kleiber, B	2½	4200	4½x5½	36x5*	36x8	W
Kleiber, C	3½	4900	4½x5½	36x5	36x5d	W
Kleiber, D	5	5600	5 x6½	36x6	40x12	W
Koehler, D	1½	2285	3½x5	34x3½	34x5	W
Koehler, M	2½	3365	4 x5¼	36x4	36x7	W
Koehler, MCS	2½	3450	4 x5½	36x4	36x7	W
Koehler, F	3½	....	4½x5½	36x5	36x10	W
Koehler,MT, Trac	5	3450	4 x5½	36x4	36x7	W
K-Z, 1	1	2250	3½x5	34x3½	34x5	W
K-Z, 1½	1½	2750	3¾x5	36x4	36x6	W
K-Z, 2½	2½	3250	4¼x5¼	36x4	36x8	W
K-Z, 3½	3½	4250	4½x5½	36x5	40x10	W
K-Z, 5	5	5200	4½x5½	36x6	40x6d	W
Lange, B	2½	3350	4½x5¼	36x4*	36x8*	C
Larrabee, U	1½	2400	3¾x5	34x3½	34x5	W

See next page for notes on truck specifications.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Larrabee, K	2½	$3400	4½x5½	36x4	36x7	W
Larrabee, L	3½	4200	4½x5½	36x5	36x5d	W
Larrabee, W	5	5100	4⅝x6	36x6	40x6d	W
L.M.C., 2-20	2½	2540	4½x5½	36x4	36x4d	I
Lion, L	1	2350	3¾x5½	35x5†	35x5†	W
Lone Star, 9	1½	1545	3½x5	32x3½†	32x4†	I
Lusedinghaus, K	2–2½	3150	4¼x5¾	36x4**	36x7*	W
Lusedinghaus, C	1	2100	3½x5	35x5†	35x5†	W
Lusedinghaus, W	1½	2700	3¾x5¼	34x3½*	34x5*	W
Maccar, L	1½	2925	4½x5½	36x4	36x6	W
Maccar, H	2½	3650	4½x5½	36x4	36x4d	W
Maccar, M-2	3½	4500	4½x6	36x5	36x5d	W
Maccar, G	5	5500	4⅝x6	36x5	40x6d	W
MacDonald, A	7½	5750	4½x6	40x7	40x14	I
Mack, AB D.R.	1½	3450	4 x5	36x4	36x3½d	D
Mack, AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack, AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack, AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack, AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack, AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack, AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack, AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac., AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac., AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac., AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac., AC	13	5750	5 x6	36x6	40x12	C
Mack Trac., AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf, AA**	2	4150	4 x5½	34x4	36x6	W
Mapleleaf, BB**	3	4775	4½x5½	36x4	36x4d	W
Mapleleaf, CC**	4	5770	4½x5½	36x5	36x5d	W
Mapleleaf, DD**	5	6825	4½x5½	36x6	40x6d	W
Master, JW	1½	2600	4½x5½	34x3½	34x5	W
Master, W	2½	3290	4½x5½	34x4	36x7	W
Master, D	2½	3540	4½x5½	34x4	36x7	D
Master, A	3½	4190	4½x6	36x5	40x5d	D
Master, E	3½	4640	4½x6	35x5	40x5d	D
Master, B	5	5290	4¾x6½	36x6	40x6d	W
Master, F	5	5440	4¾x6½	35x5	40x6d	D
Master Trac., T	6	3740	4½x5½	34x4	36x4d	I
Maxwell, 1½	1½	1332	3⅝x4¼	32x3	32x4	W
Menominee, HT	1	2080	3¾x5	34x3½	36x5	W
Menominee, H	1½	2725	4 x5	36x3½	36x5	W
Menominee, D	2	3245	4 x6	36x4	36x4d	W
Menominee, G	3½	4270	4½x6	36x5	36x5d	W
Menominee, J3	5	5450	4¾x6	36x6	40x6d	W
Moline, 10	1½	2450	3½x5	34x5†	36x6†	I
Moreland, 20N	1	2850	3¾x5	35x5†	36x6†	I
Moreland, 21B	1½	3125	4½x5½	36x3½	36x6	W
Moreland, 21C	2½	3900	4½x5½	36x4	36x8	W
Moreland, 21H	3½	4975	4¾x6	36x5	40x5d	W
Moreland, 21J	5	5350	4¾x6	36c6	40x6d	W
Mutual, 2B	2	3450	4 x6	36x4	36x8	W
Mutual, 2BP	2½	4150	4 x6	38x7†	42x9†	W
Napoleon, 7	¾–1	1350	3½x5	38x4	33x4†	I
Napoleon, XX–7	1	1535	3½x5	35x5*	35x5*	I
Napoleon, 11	1½	1860	3½x5	35x5*	36x6*	I
Nash, 2018	1	1895	3¾x5¼	34x3	34x4	I
Nash, 3018	2	2550	3¾x5¼	34x4	34x6	I
Nash, Quad.	2	3250	4½x5½	36x5	36x5	I
*Nelson, F1½	1½	....	4½x5¼	36x3½	36x5	W
*Nelson, F2	2	....	4½x5¼	36x4	36x7	W
*Nelson, F3½	3½	....	4½x5½	36x5	36x5d	W
*Nelson, FC5	5	....	4¾x6	36x6	40x6d	W
Netco, D	2	3100	4½x5¼	36x4*	36x7*	W
Netco, H	2½	3500	4½x5½	36x4*	36x8*	W
New York, M	1½	....	4½x5¼	36x3½	36x5	W
New York, N	2–2½	....	4½x5¼	36x4	36x4d	W
Niles, E	2	3000	4½x5¼	36x4*	36x7*	W
Noble, B30	1½	2585	3¾x5¼	36x3½	36x5	W
Noble, C40	2	2825	4 x5½	36x4	36x7	W
Noble, D50	2½	3150	4½x5½	36x4	36x8	W
Noble, E70	3½	4030	4½x6	36x5	36x10	W
Northway, B-2	2	3400	4 x6	36x4	36x4d	W
Northway, B-3	3½	4400	4 x6	36x5	40x5d	W
Northwestern W	2	3300	4½x5½	34x4	36x6	W
Northwestern WS	2½	3300	4½x5½	36x4	36x8	W
Norwalk, 25E	1	1695	3½x5	34x3½	34x4	W
Norwalk, 35E	1½	2025	3½x5	34x3½	34x3½d	W
Ogden, A1	1½	2550	3¾x5	36x3½	36x5	W
Ogden, E	2½	3250	4½x5¼	36x4	36x7	W
O. K., K1	1½	2675	4 x5½	36x3½†	36x7†	W
O. K., L1	2½	3450	4½x5½	36x4	36x8	W
O. K., M1	3½	4250	4½x6	36x5	36x5d	W
Old Hickory, W	1	2175	3¾x5	36x3½*	36x4*	W
Old Reliable, A	1	2350	4 x5	34x4	36x6	W
Old Reliable, B	1½	3500	4½x6	34x4	36x4d	W
Old Reliable, C	2½	4250	4½x6	36x5	36x5d	W
Old Reliable, D	3½	5250	4¾x6	36x6	40x6d	W
Old Reliable, KLM	5	6250	4¾x6½	36x6	40x7d	C
Oldsmobile Econ.	1	1500	3½x5½	35x5†	35x5†	I
Olympic, A	2½	3500	4½x5½	36x4	36x7	W
Oneida, A-9	1½	2350	3¾x5½	36x3½	36x5	W
Oneida, B-9	1¾	2915	4 x5½	36x4	36x7	W
Oneida, C-9	2½	3390	4 x5½	36x4	36x7	W
Oneida, D-9	3½	4345	4½x5½	36x5	36x10	W
Oneida, E-9	5	5460	4½x5½	36x6	40x12	W
Orleans, A	1½	2750	3¾x5½	36x3½	36x5	W
Orleans, B	2½	3250	4x5½	36x4*	36x7*	W
Orleans, C	3½	3750	4½x5½	36x4½	36x8	W
Orleans, D	5	4250	4½x5½	36x6	40x8	W
Oshkosh, A	2	....	3½x5	36x6†	36x6†	4
Oshkosh, AA	2	....	3½x5	36x6†	36x6†	4
Packard, EC	....	3700	4¾x5½	36x3½	36x6	W
Packard, ED	....	4450	4½x5½	36x5	36x5d	W
Packard, EF	....	5550	5 x5½	36x6†	40x6d†	W
Packard, EX	....	4200	4½x5½	36x6†	38x7†	W
Paige, 52–19	1½	2880	4 x5¼	34x3½	34x6	W
Paige, 54–20	2½	3400	4½x5½	34x4	34x4d	W
Paige, 51–18	3½	4285	4½x5½	36x5	36x5d	W
Parker, PZ0	2	3500	4 x6	34x4	36x4d	W
Parker, JZ0	3½	4400	4½x6	36x5	40x5d	W
Parker, MZ0	5	5500	4¾x6	36x6	40x6d	W
Patriot, Revere	¾	1785	3¾x5	35x5†	35x5†	W
Patriot, Lincoln	1½	2450	4 x5¼	34x3½*	34x5*	W
Patriot, Washgt'n	2½	$3450	4½x5½	36x4*	36x7*	W
Piedmont, 4-30	1½	1685	3½x5	34x4†	34x4†	W
Pierce-Arrow,	2	3750	4 x5½	36x4	36x4d	W
Pierce-Arrow	3½	4950	4½x6⅜	36x5	36x5d	W
Pierce-Arrow	5	5700	4½x6⅜	36x5	40x6d	W
Pioneer, 59	1	1650	3¾x4¼	32x4½†	32x4½†	W
Pittsburger, B	2½	3500	4½x5¼	36x5*	36x7*	W
Pony	¼	400	2¾x4	28x3†	28x3†	C
Power, F	1½	....	3¾x5¼	36x6	36x6	..
Power, C	3½	....	4¼x5½	36x5	40x10	W
Premocar, B–143	1½	2475	3½x5	36x6†	36x6†	W
Rainier, R–11	¾	2150	3½x5	35x5†	35x5†	W
Rainier, R–15	3½	4500	4½x5½	36x5	36x5d	W
Rainier, R–19	1	2350	3½x5	34x3½	31x4	W
Rainier, R–16	1½	2600	3¾x5	34x3½	34x5	W
Rainier, R–18	2	2950	4½x5¼	34x4	34x6	W
Rainier, R20	2½	3600	4½x5¼	34x4	34x7	W
Rainier, R17	5	5250	4½x5½	36x6	36x6d	W
Ranger, TK–20–2	2	....	3¾x5	36x6†	36x6†	W
Reo, F	¾–1¼	1385	4½x4½	34x4½†	34x4½†	B
Reliance, 10A	1½	2500	4 x5½	36x3½	36x5	I
Reliance, 20B	2½	3200	4¼x5½	36x4	36x4d	I
Republic, 10	1	1695	3¾x5	35x5†	35x5†	I
Republic, 10Exp.††	1	2095	.....	35x5†	35x5†	I
Republic, 11X	1½	2295	3¾x5	34x3½	34x5	I
Republic, 19	2½	2795	4½x5½	36x4	36x7	I
Republic, 20	3½	3845	4½x5½x	36x5	36x10	I
Riker, B	3	....	4¼x6	36x5	36x5d	W
Riker, BB	4	....	4¼x6	36x5	36x6d	W
Rowe, CW	1½	3000	3¾x5	36x6†	36x6†	W
Rowe, HW	4	4500	4¼x6	36x5	36c6d	W
Rowe, C. D. W.	2	3300	4 x5	34x4	36x3½d	W
Rowe, G. S. W.	3	4150	4 x6	34x5	36x5d	W
Rowe, G. P. W.	3	5250	3½x5†	38x7†	42x9†	W
Rowe, F. W.	5	5500	4½x6	36x6	40x6d	W
Rumely, A	1½	2720	3¾x5¼	36x3½	36x5	W
Samson, KO 15	¾	865	.....	32x4	32x4	B
Samson, E 25	1¼	1395	.....	35x5	35x5	B
Sandow, G	1	2295	3¾x5	34x3½	34x5	W
Sandow, CG	1½	2590	3¾x5	34x4	34x6	W
Sandow, J	2½	3375	4½x5½	36x4	36x7	W
Sandow, M	3½	4295	4½x5½	36x5	36x5d	W
Sandow, L	5	4975	4½x5½	36x6	40x6d	W
Sanford, 25	2½	3350	4½x5¼	36x4	36x4d	W
Sanford, 35	3½	4200	4½x5½	36x5	36x5d	W
Sanford, 50	5	5100	4¾x6	36x5	40x6d	W
Schacht, 2-Ton	2	3550	4¼x5½	36x4	36x7	W
Schacht, 2½-Ton	2½	3850	4¼x5½	36x4	36x4d	W
Schacht, 3½-Ton	3½	4350	4¼x6	36x5	36x5d	W
Schacht, 5-Ton	5	5350	4½x6	36x5	40x6d	W
Schwartz, A	1	1585	3½x5	33x4½†	33x4½†	B
Schwartz, BW	1½	2600	3¾x5¼	34x3½*	34x7*	W
Schwartz, C.W.S.	2½	3200	4¼x5½	36x4	36x8	W
Schwartz, DW	5	4900	4½x6	36x6	40x12	W
Selden, 1½A	1½	2360	3¾x5	34x3½	34x5	W
Selden, 2½A	2½	3425	4½x5¼	36x4	36x7	W
Selden, 3½A	3½	4175	4½x5½	36x5	36x10	W
Selden, 5A	5	5600	4¾x6	36x6	40x12	W
Seneca, M20	½	....	3½x4½	30x3½†	30x3½†	B
Service, 220	1	2415	3½x5½	34x3½	34x5	W
Service, 15	¾–1	1840	4¾x5	34x4½	34x5	B
Service, 31	1½	2985	4 x5½	36x3½	36x6	W
Service, 36	1½	3415	4¼x5½	35x5†	38x7†	W
Service, 51	2½	3475	4¼x5½	36x4	36x7	W
Service, 71	3½	4285	4¼x5½	36x5	36x5d	W
Service, 76	3½	4485	4½x6	36x5	36x5d	W
Service, 101	5	5275	4½x6	36x6	40x6d	W
Signal, NF	1	2475	4¾x5	34x5†	36x6†	W
Signal, H	1½	2925	4½x5¼	34x4	36x6	W
Signal, J	2½	3275	4½x5¼	34x4	36x8	W
Signal, M	3½	4275	4½x5½	36x5	40x5d	W
Signal, R	5	5300	4¾x6	36x6	40x6d	W
Southern, 10	1	2090	3¾x5	34x4½	34x4	W
Southern, 15	1½	2590	3¾x5½	36x6†	34x4	W
Southern, 15	2	2990	4 x5¼	36x6†	40x8*	W
Standard, 1–K	1–1¼	2250	3¾x5	34x3½*	34x4*	W
Standard, 1K	1–1¼	2600	3¾x5	36x6†	36x6†	W
Standard, 76	2½–3	3100	4½x5¼	36x4*	36x7*	W
Standard, 66	3½–4	4000	4½x5½	36x5	36x5d	W
Standard, 5–K	5–6	5250	4¾x6	36x6	40x6d	W
Sterling, 1½	1½	3200	4 x5¾	36x3½	36x5*	W
Sterling, 2	2	3500	4 x5¾	36x4	36x6	W
Sterling, 2½	2½	3650	4¾x5¾	36x4*	36x4d*	W
Sterling, 3½	3½	4650	4½x6½	36x5*	40x5d*	W
Sterling, 5–W	5	5500	5 x6½	36x6*	40x6d*	W
Sterling, 5–C	5	6000	5 x6½	36x6	40x6d	C
Sterling, 7½	7½	6500	5 x6½	36x6	40x7d	C
Stewart, 11	¾	1350	3½x4½	32x4†	32x4†	I
Stewart, 12	1	1750	3½x5	35x5†	35x5†	I
Stewart, 9	1½	2200	3¾x5	34x3½	34x5	I
Stewart, 7	2	2800	4½x5¼	34x4	34x7	I
Stewart, 7–X	2½	2950	4¼x5½	34x4	34x7	I
Stewart, 10	3½	3850	4½x5½	36x5	36x5d	I
Stewart, 10–X	3½	3850	4½x6	36x5	36x5d	I
Stoughton, A	1	1995	3¾x5¼	34x4½†	35x5†	W
Stoughton, B	1½	2350	3¾x5¼	36x3½	36x5	W
Stoughton, D	2	2800	4 x5½	36x4	36x7	W
Stoughton F	3	3600	4¼x5½	36x5	36x5	W
Sullivan, E	2	3350	4¼x5½	36x4*	36x7*	W
Sullivan, H	3½	4650	4½x6	36x5	36x5d	W
Superior, D	1	1800	3¾x5	34x4½†	34x4	I
Superior, E	2	2750	4¼x5¼	36x4	36x6	I
Super Truck, 50	2½	3300	4 x6	36x4	36x8	W
Super Truck, 70	3½	4300	4½x6	36x5	40x5d	W
Super Truck, 100	5	5300	4¾x6	36x5	40x12	W
Super Truck 150	7½	6300	5 x6	36x6	40x7d	W
Texan, A38	¾	1095	3½x5	33x4	33x4	I
Texan, TK39	1½	$1550	3½x5	36x6	38x7	W
Texan, TK	1½	....	3½x5	36x6†	38x7†	..
Tiffin, F15	1½	2695	4½x5¼	36x4	36x4d	W
Tiffin, F25	2½	3580	4½x5¼	36x4	36x3½d	W
Tiffin, F35	3½	4760	4½x5½	36x5	40x5d	W
Tiffin, F50	5	5850	4¾x6	36x6	40x6d	W
Tiffin, F60	6	6050	4¾x6	36x6	40x12	W
Titan, HT	3½	4550	4½x6	34x4*	40x5d	I
Titan, HD	6	5400	4½x6	36x5	40x6d	I
Titan, TS	2½	3400	4¼x5½	34x4*	36x4d	I
Tower, J	1½	3000	4½x5¼	35x5	38x7	W
Tower, H	2½	3475	4½x5¼	36x4	36x7	W
Tower, G	3½	4400	4½x5½	36x5	36x5d	W
Traffic, C	2	1595	3¾x5	34x3½*	34x5*	I
Transport, 20	1	1850	3¾x5⅛	34x3½	34x4	I
Transport, 30	1½	2250	3¾x5	36x3½	36x5	I
Transport, 50	2½	2785	4¼x5½	36x4	36x7	I
Transport, 70	3½	4195	4½x6	36x5	36x10	I
Traylor, B	1½	2500	3¾x5½	36x4	34x5	W
Traylor, C	2	3000	4 x5½	36x4	36x7	W
Traylor, D	3	3500	4¼x5½	36x4	36x8*	W
Traylor, E	4	4700	4½x6	35x5	40x10	W
Traylor, F	5	5100	4½x6	36x6	40x6d	W
Triangle, AA	¾–1	1600	3½x5	35x5†	35x5†	I
Triangle, A	1½	2350	3¾x5¼	34x3½*	34x6*	I
Triangle, C	2	2700	3¾x5¼	36x4*	36x6*	I
Triangle, B	2½	2950	4 x5¾	36x4*	36x7*	I
Triumph, HB	2	2900	3¾x5¼	36x4	36x7	W
Triumph, HC	1½	2550	3¾x5¼	36x3½	36x5	W
Triumph, G	1	1995	3½x5½	34x5†	34x5†	W
Twin City, B.W.	2	3000	4 x5½	36x4	36x7	I
Twin City, A. W.	3½	4400	4¼x6	36x5	40x5d	W
Twin City, FWDB	3½	4750	5½x6	36x6	36x6	I
Twin City, FWDA	5	5250	5½x6	36x7	36x7	I
Ultimate, A	2	3209	4 x5½	36x3½*	36x5*	W
Ultimate, AJ	2	3250	4¼x5½	35x5†	38x7†	W
Ultimate, B	3	3750	4¼x5½	36x4*	36x4d*	W
Ultimate, BL	3	3850	4¼x5½	36x4*	36x4d*	W
Union, F W	2½	3490	4 x6	36x5*	36x8*	D
Union, H W	4	4485	4½x6	36x6	40x12	D
Union, J W	6	5800	5 x6	36x6	40x14	D
United, A	1½	2445	3¾x5¼	36x3½*	34x5*	I
United, B	2½	3150	4¼x5½	36x4*	36x7*	I
United, C	3½	3975	4¼x5½	36x5	36x5d	I
United, V	5	5100	4½x6	36x6	40x6d	I
U. S., N	1½	2475	3¾x5	36x3½*	36x5*	I
U. S., R	3	3795	4 x5¼	36x4	36x4d	W
U. S., S	4	4595	4½x5½	36x5	36x5d	W
U. S., T	6	5850	4¾x6½	36x6	40x6d	W
Velie, 46	1½	2200	3¾x5	36x3½	36x5	I
Veteran**	1–1½	3500	3¾x5¼	36x6†	36x6‡	W
Veteran**	2–2½	4000	4¼x5½	36x4*	36x7*	W
Veteran**	2½–3	4400	4¼x5½	36x4*	36x7*	W
Veteran	3½–4	5600	4¼x6	36x5	36x5d	W
Victor, A	1½	2050	3¾x5	34x4	34x5	I
Vim, 29	½	1355	3½x4½	31x4†	31x4†	W
Vim, 31	1	2475	3¾x5½	35x5†	35x5†	W
Vim, 22	2	3150	3¾x5½	36x4	36x6	W
Vim, 23	3	3950	4¼x5½	36x5	36x5d	W
Vulcan, 25	2½	4000	4¼x6	36x4	36x8	W
Vulcan, 25P	3	4800	4¼x6	36x6	40x8	W
Walker-Johnson, B	2½	3500	4¼x5½	36x4	36x8	W
Walter, S	5	5600	4½x6¼	36x5	40x6d	I
Waltham, E	1½	2350	3¾x5¼	36x6†	38x7†	W
Ward–LaF., 2B	2½	3590	4¾x5¾	36x4	36x7	W
Ward–LaF., 4A	3½	4690	4½x6¼	36x5	36x5d	W
Ward–LaF., 5A	5	5590	5 x6¼	36x6	36x6d	W
Watson, B	1	1865	3¾x5¼	34x4½†	34x4½†	W
Watson, N	3½	4250	4½x5½	36x5	36x10	W
Western, W1½	1½	2550	4¼x5¼	36x3½*	36x5*	W
Western, L1½	1½	2550	3¾x5	36x3½*	36x5*	W
Western, W2½	2½	3250	4½x5¼	36x4	36x7	W
Western, L2½	2½	3250	4¼x6	36x4	36x7	W
Western, W3½	3½	4250	4½x6	36x5	40x5d	W
White, 15	¾	2600	3¾x5½	34x5†	34x5†	B
White, 20	2	3450	3¾x5½	36x4	36x7	D
White, 40	3½	4500	3¾x5¾	36x5	40x5d	D
White, 45	5	5000	4¼x5¾	36x6	40x6d	D
White, Hick., E	1	2450	3¾x5	34x5†	34x5†	W
White, Hick., H	1½	2750	3¾x5	36x3½	36x5	W
White Hick., K	2½	3350	4¼x5¼	36x4	36x7	W
Wichita, K	1	2300	3½x5	36x3*	36x4*	W
Wichita, L	1½	2600	3¾x5¼	36x3½*	36x5*	W
Wichita, M	2	2800	3¾x5¼	36x3½*	36x6*	W
Wichita, R	2½	3000	3¾x5¼	36x4*	36x7*	W
Wichita, RX	2½	3600	4¼x6	36x4*	36x8*	W
Wichita, O	3½	4000	4¼x6	36x5*	36x5d*	W
Wichita, S	5	5000	4½x6	36x6	40x6d	W
Wilcox, AA	1	2100	3¾x5½	36x4*	36x4*	W
Wilcox, B	1½	2775	4¼x5	36x4	36x5	W
Wilcox, D	2½	3300	4¼x5	36x4*	36x3½d*	W
Wilcox, E	3½	4250	4½x6	36x5*	36x5d*	W
Wilcox, F	5	5200	4¾x6½	36x5	40x6d	W
Wilson, F	1½	2650	3¾x5	36x3½	36x5	W
Wilson, EA	2½	3300	4½x5¼	36x4	36x7	W
Wilson, G	3½	4300	4½x5½	36x5	36x5d	W
Wilson, H	5	5275	4½x5½	36x6	40x6d	W
Winther, 751	¾	1795	3½x5	34x4½†	35x5†	I
Winther, 430	1½	2850	3¾x5	32x4	32x4	I
Winther, 39	1½	2450	3¾x5	34x3½	34x5	I
Winther, 49	2	3250	4 x5	34x4	34x4d	I
Winther, 450	2½	3690	4 x5	34x5	36x6	I
Winther, 70	3½	4200	4 x6	36x5	36x5d	I
Winther, 109	5	5250	4½x6	36x6	40x5d	I
Winther, 140	7	5900	5 x6	36x6	40x7d	I
Witt–Will, N	1½	2750	3¾x5	36x3½*	36x5*	W
Witt–Will, P	2½	3250	4½x5¼	36x3½*	36x7*	W
Wolverine, J	1	2240	3½x5	34x3	34x4	I
Wolverine, J	1½	2495	3¾x5	34x3½	34x5	I
Wolverine, J	2	2750	3¾x5	34x4	34x7	I
Wolverine, J	2½	3475	4½x5¼	36x5	36x10	I
Wolverine, L	3½	4150	4½x5½	36x5	36x10	I
Yellow Cab M2	¾	2050	3¾x5	32x4	32x4	B
Yellow Cab M4	1¼	2350	3¾x5	34x4½	34x4½	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Kelly-S., Kelly-Springfield. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction. B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. All others solid. ††—Price includes body. §—Price includes several items of equipment.

*Nelson Le Moon

Farm Tractor Specifications and Prices

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
All-In One	12-25	$1975	3	Weid.	4-3¾x5½	GDK	2-3
Allis-Chalm. B	6-12	925	..	....	.....	.....	..
Allis-Chal. G.P	6-12	850	2	LeR.	4-3½x4½	Gas.	1-2
Allis-Chalm.	12-20	1495	..	Mid.W	4-4½x5½	Gas.	2-3
Allis-Chalm.	18-30	2150	4	Own	4-4¾x6½	GorK	3-4
Allis-Chalm.	10-18	875	4	Own	4-4¾x6½	G,K	4
Allwork. 2-G	14-28	....	4	Own	4-4¾x6	GorK	3
Allwork. C	14-28	....	4	Own	4-5 x6	GorK	3
AndrewsKin. D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
Ano. A	3-5	....	4	Own	1-4½x5	Gas.	..
Appleton	12-20	1500	4	Buda	4-4¼x5½	G,K	2-3
Aultman-T.	15-30	....	4	Clim.	4-5 x6½	G,K	4
Aultman-T.	22-45	....	4	Own	4-5½x8	G,K	6
Aultman-T.	30-60	....	4	Own	4-7 x9	G,K,D	8
Automot. B-3	12-24	1785	4	Here'ls	4-4 x5½	Gas.	2-3
Avery. SR. Cul	5-10	....	4	Own	4-3 x4	G,K	..
Avery. Cult-C	.....	....	3	Own	6-3 x4	G,K	..
Avery. B	5-10	....	4	Own	4-3 x4	G,K	2
Avery. C	.....	....	4	Own	6-3 x4	G,K	..
Avery	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery	14-28	....	4	Own	4-4½x7	G,K,D	3-4
Avery	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery	25-50	....	4	Own	4-6½x7	G,H,D	5-6
Avery	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates All St.	15-25	....	4	Own	4-4¼x6	Ker.	3
Bates. S.M.	15-22	....	*4	Own	4-4¼x6	G,K,D	3
Bates Mule. F	18-25	....	*2	Midw	4-4½x5¼	Gas.	3
Bates Mule. H	15-25	....	4	Midw	4-4½x5¼	Gas.	3
Bates Mule G	25-35	....	*2	Midw	4-4½x6	Gas.	com.
Bean	8-16	....	*1	Own	14-3½x4	G,K	2-3
Beeman. G	2-4	340	4	Own	1-3½x4½	Gas.	½
Best. 30	20-30	3250	*2	Own	4-4¾x6½	G,K,D	4
Best. 60	35-60	5750	*2	Own	4-6½x8	G,K,D	8-9
Boring. 1921	.....	1850	3	Wauk	4-4¾x5¾	GorK	2
Bull	12-24	1200	3	Toro.	2-5½x7	G,K	3
Burn-Oil. 1921	15-30	1650	4	Own	2-6¾x7	Ker.	3-4
Capital	15-30	1000	2	Own	4-4½x6	Gas.	33
Case	10-18	1250	4	Own	4-3½x5	GorK.	2
Case	15-27	1865	4	Own	4-4½x6	GorK	3
Case	22-40	3350	4	Own	4-5½x6¾	GorK	4-5
Caterpillar T11	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar T16	40	....	*2	Own	4-6½x7	Gas.	6
Chase	12-25	....	3	Buda	4-4¼x5½	GorK	2-3
Chicago. 40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac. W	12-20	1495	*2	Own	4-4 x5½	G,K,D	2-3
Dakota. 4	15-27	1750	3	Dom.	4-4¾x6	Gas.	3
Dart. B.J.	15-30	....	4	....	4-4½x6	Gas.	3-4
Depue. A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill. D	20	2480	4	Cont.	4-4½x5½	Gas.	3
Do-It-All	4-6	595	..	Own	1-4½x5	Gas.	5-6
Eagle. F	12-22	1390	4	Own	2-7 x8	GorK	3-4
Eagle. F	16-30	1850	4	Own	2-8 x8	GorK	4-5
E-B	12-20	....	4	Own	4-4¾x5	GorK	4
E-B. Q	12-20	....	4	Own	4-4¾x5	GorK	3
E-B. D	16-32	....	4	Own	4-5¼x7	GorK	4
E-BReeves	40-65	....	4	Own	4-7¼x9	GorK	8-10
Evans	18-30	2000	4	Buda	4-4½x6	G,K	3
Fageol. D	9-12	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse	18-30	1885	4	Clim.	4-5 x6½	G,K	3-4
Farquhar	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch. 4	20-35	....	4	Clim.	4-5 x6½	GorK	3-4
Flour City	20-35	....	4	Own	4-5¼x6	Ker.	4-6
Flour City	30-50	....	4	Own	4-6¾x7	Ker.	6-8
Flour City	40-70	....	4	Own	4-7½x9	Ker.	8-1
Fordson	.. 20	625	4	Own	4-4x5	G,K	2
Fox. E	20-40	1300	4	Own	4-5½x7½	G or K	4
Franklin Bull G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-3
Franklin Bull C	18-30	3350	*2	Clim.	4-5x6½	G or K	3-4
Franklin Bull G 2	18-30	4350	....	....	.....	.....	....
Frick. A	12-20	....	4	Erd.	4-4 x6	G,K	2-4
Frick. C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
G-O. G	14-28	$1485	4	Wauk.	4-4½x5¾	GorK	3
Grain Belt. A	18-36	2150	4	Wauk	4-4¾x6¾	GorK	4
Ground Hog	19-31	2000	4	Erd.	4-4 x6	GorK	3
Gt. Western St	20-30	1950	4	Beav.	4¾x6	K.	4
Hart-Parr. 20	-20	1195	4	Own	2-5¼x6½	K.D	3
Hart-Parr. 30	15-30	1595	4	Own	2-6½x7	K,D	3
Heider. D	9-16	....	4	Wauk	4-4¼x5¾	G,K	2
Heider. C	12-20	....	4	Wauk	4-4½x6¾	G,K	3
Heider. Cult	6-10	....	4	LeR.	4-3½x4½	Gas.	1
Hicks	20-30	....	4	....	4-4½x6	KorG	4
Huber Light 4	12-25	2500	4	Wauk	4-4½x5¾	GorK	3
Huber Super 4	15-30	1885	*2	Midw.	4-4½x6	Gas.	3
Illinois. C	18-36	2500	4	Clim.	4-5 x6½	G,K	4
Imperial. E	40-70	5000	4	Own	4-7½x9	G,K,D	10
Indiana. F	5-10	....	4	LeR.	4-3½x4½	Gas.	1
International.	8-16	1000	4	Own	4-4¼x5	G,K,D	2
International.	15-30	1950	4	Own	4-5¼x8	G,K,D	4
J-T. N	20-40	3485	*2	....	4-4¾x6	G,K	3-4
Keck-Gon	15-30	1650	4	Own	2-7¼x8	G,K	3
Klumb. F	16-32	....	4	Clim.	4-5 x6½	....	..
LaCrosse. M	7-12	900	4	Own	2-4 x6	G,K	1
LaCrosse. G	12-24	1250	4	Own	2-6 x7	GorK	3
Lauson	12-25	1495	4	Midw.	4-4½x5¼	Gas.	3
Lauson	15-30	1685	4	Beav.	4-4¾x6	GorK	3-4
Lauson. 21	15-30	1985	4	Beav.	4-4¾x6	GorK	3-4
Leader. B	12-18	1095	4	Own	2-6 x6¼	G,K,D	2-3
Leader. N	16-32	1985	4	Clim.	4-5 x6½	G,K	3-4
Leader. GU	18-35	2775	*	Clim.	4-5x6½	G,K	3-4
Leonard. E	20-30	2530	4	Buda	4-4½x6	G,K	3
Liberty. A	18-32	2475	4	Clim.	4-5 x6½	G,K	4
Linn. W	60	5600	*	Wauk.	4-5 x6¼	Gas.	6
Little Bear	4	850	4	Ford	4-3¾x4	Gas.	..
Little Giant. B	16-22	2200	4	....	4-4½x5	K.	4
Little Giant. A	26-35	3300	4	....	4-5½x6	K.	6
Lombard	85-150	....	*2	....	6-5½x6¾	Gas.	16
Motor Macult	1½	225	2	Own	1-2¾x3½	Gas.	..
Magnet. B	14-28	1875	4	Wauk	4-4½x6¼	K&G	3
Market	2-4½	....	..	Vur.	1-4 x4	Gas.	..
Master Jr.	5-10	585	..	LeR.	-2¾x4	Gas.	1
Merry Gar 1921	2	230	2	Evin	1-2¾x2½	Gas.	..
Minne. All-P	12-25	1325	4	Own	4-4½x7	GorK	3
Mohawk. 1921	8-16	785	4	Light	4-3½x4½	KorG,	1-2
Moline Univ D	9-18	1075	2	Own	4-3½x5	Gas.	2-
Moline Orch	9-18	1075	2	Own	4-3½x5	Gas.	2-3
Monarch B	30-20	3400	*2	Beav.	4-4¾x6	G or K	4
Motox	15-30	2250	4	Buda	4-4½x6	Gas.	3-4
New Britain. 1	3-6	425	4	Own	2-3¼x4	Gas.	¾
New Britain. 2	3-6	425	4	Own	2-2¾x4	Gas.	¾
Nichols-Shep. 20-42	20-42	3100	..	Own	8 x10	GorK	3-6
Nichols Shep. 25-50	25-50	3460	..	Own	9 x12	GorK	4-7
Nilson Jr. E	16-25	1595	4	Wauk	4-4¼x5¾	G or K	3
Nilson Senior	20-40	2675	5	Wauk	4-5 x6¼	G,K	4
Oil Pull. K	12-20	1785	4	Own	2-6 x8	K,D	3
Oil Pull. H	16-30	2665	4	Own	2-7 x8½	K,D	4
Oil Pull. G	20-40	3750	4	Own	2-8 x10	K,D	5-6
Oil Pull. E	30-60	5275	4	Own	2-10x12	K,D	8-10
Oldsmar Gar.	2½-5	395	4	Own	1-5½x5½	G.K,D	2½
Oliver. A	15-30	....	*2	Beav.	4-4½x6	GorK	3-4
Once Over Tiller Mark. 6	12-25	3000	4	Strns	4-4½x6	Gas.	2
Parrett. K	15-30	1950	4	Pitt	4-4½x6	G,K	3
Peoria. L	12-25	1785	4	Clim.	4-5 x6½	G,K	3
Pioneer. G	18-36	....	4	Own	4-5½x6	G,K,D	4
Pioneer. C	30-60	....	4	Own	4-7 x8	Gas.	10
Planet Jr.	5-10	950	2	LeRoi	4	Gas	1
Plowman. A	15-30	1995	4	Buda	4-4½x6	G,K	3-4
Port Huron. A	12-25	1700	4	Chief	4-4¾x6	G,K	3
Post. D	12-20	$1800	4	Wauk	4-4¼x5¾	GorK	2
Prairie Dog. L	9-18	650	3	Wauk	4-3¾x5¼	Gas.	2
Prairie Dog. D	15-30	1250	4	Wauk	4-4½x6¼	Gas.	3
Ranger Cul. TK-20	8-16	....	4	LeR.	4-3½x4½	Gas.	1
Reed	15-30	2250	4	Dom	4-4¾x6	K.	3-4
Reed. A-1	18-36	2400	4	Dom	4-5 x6	Gas.	3-4
Reliable	10-20	985	4	Own	2-6 x7	Ker.	2
Rex	12-25	1600	4	Wauk	4-4¼x5¾	GorK	3
Russell	12-24	....	4	Own	4-4½x5¾	GorK	2-3
Russell	15-30	....	4	Own	4-5 x6½	GorK	3 4
Russell	20-35	....	4	Own	4-5½x7	GorK	4-5
Russell	30-60	....	4	Own	4-8 x10	GorK	8-10
Samson. M	2	995	4	Own	4-4 x5½	G,K	2
Sandusky. J	10-20	1250	4	Own	4-4¼x5½	G,K,D	2
Sandusky. E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shawnee Com.	6-12	....	2	LeR.	4-3½x4½	Gas.	10
Shawnee Com.	9-18	....	2	Gray	4-3½x5	....	....
Shelby. C	10-20	....	4	Erd.	4-4 x6	GorK	2-3
Shelby. D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Short Turn	20-40	1500	3	....	4-4¾x6	G,K	3
Square T. A	18-35	2075	3	Clim.	4-5 x6½	K,G	3
Steady Pull	12-23	1485	4	....	4-4 x5	Gas.	3
Stinson. 4E	18-36	1835	4	Beav.	4-4¾x6	G,K	4
Stone	20-40	....	4	Beav.	.....	G,K	4
Tioga. 3	15-27	2625	4	Wisc.	4-4½x6	Gas.	3-4
Titan	10-20	1000	4	Own	2-6½x8	G,K,D	3
Tillermo. A	2-6	385	..	Vur.	1-4 x4	G,K	..
Topp. B	30-45	4000	4	Wauk	4-4¾x6¾	Gas.	3-4
Toro. Tractor	6-12	950	4	LeR.	4-3½x4½	Gas.	2
Townsend	10-20	....	2	Own	4-6½x7	Ker	2-3
Townsend	15-30	....	2	Own	4-7 x8	Ker	3-4
Townsend	25-50	....	2	Own	4-8½x10	Ker	4-8
Traction Motor	40-50	....	4	....	8-3½x5	Gas.	4-5
Traylor. TB	6-12	815	4	LeR.	4-3½x4½	Gas.	1
Triumph. H	18-36	2450	2	Erd.	4-4¾x6	Ker.	4
Trundaar. 10	25-40	4250	*2	Wauk	4-5 x6¼	GorK	4
Turner. 1921	14-25	1295	4	Buda	4-4¼x5½	G,K	3
Twin City	12-20	....	4	Own	4-4¼x6	G,K	3
Twin City	20-35	....	4	Own	4-5¼x6¾	G,K	5
Twin City	40-65	....	4	Own	4-7¾x9	G,K	8
Uncle Sam C20	12-20	1385	4	Wid	4-4 x5½	G or K	2-3
Uncle Sam B19	20-30	2300	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	2075	4	Beav.	4-4¾x6	G or K	3-4
Universal	1-4	475	2	Own	1-3½x5	G	1
Utilitor. 501	2½-4	380	4	Own	1-3½x4½	G	5-6
Velie. Biltwell	12-24	1750	4	Own	4-4½x5½	G,K,D	3
Victory. 1921	9-18	1350	4	Gray.	4-3½x5	Gas.	2
Victory. 1921	15-30	1750	4	Wauk	4-4¾x5¾	Gas.	3
Vim. B	15-30	1650	4	Wauk	4-4¾x5¾	G,K	3
Wallis. K	15-25	1600	4	Own	4-4¼x5¾	G,K	3
Waterloo. N	12-25	....	4	Own	2-6½x7	G,K	3
Webfoot. 40	25-40	4000	..	....	.....	.....	..
Webfoot. 53	28-53	5250	*2	Wisc.	4-5¾x7	G,D	6
Wellington. B	12-22	....	4	Erd.	4-4 x6	Ker.	2-3
Wellington. F	16-30	....	4	Chief	4-4¾x6	Ker.	3-4
Western. 1920	16-32	2100	4	Clim.	4-5x6½	Gas.	4
Wetmore	12-25	1650	4	Wauk	4-4 x5¾	G,K	2-3
Wharton. E	12-20	1800	3	Gray	4-3¾x5	Gas.	2
Whitney	9-18	1175	4	Own	2-5½x6½	Gas.	2
Wichita. T	15-30	2500	4	Bear.	4-4½x6	G,K,D	3-4
Wisconsin. E	16-30	2250	4	Clim.	4-5 x6½	Ker.	4
Wisconsin. H	22-40	2960	4	Clim.	4-5½x7	Ker.	5
Zelle	12-25	....	4	....	4-4½x5½	GorK	3

ABBREVIATIONS; G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14-in. plows. LeR—LeRoi. Clim.—Climax. Beav.—Beaver. Dom.—Doman. Cont.—Continental. Wauk.—Waukesha. Wisc.—Wisconsin. T.C.—Twin City. Vur.—Vurac. Evin.—Evinrude. Midw.—Midwest. Weid.—Weideley. Com.—Commercial Tractor. *—Crawler type. All others are wheel type.

THE CALL OF THE ROAD

Concluded from page 16

about under gay-colored parasols. One showed a desert scene with the usual cactus and the skull and ribs of a coyote—a grim reminder of the need for an efficient car when touring in waste places. Others reproduced mountain cabins and real pine boughs with huge cones added to the effectiveness.

Entertainment was provided for in a wide variety of ways. In one salesroom a miniature golf course was laid out. A professional was on hand to give instructions. A contest was staged and prizes awarded. Some of the dealers made excellent use of a motion picture outfit. Events in which their cars have figured prominently were reproduced. One dealer exhibited a film showing how his car is made at the factory. Professional entertainers also helped out and dancing was a regular evening feature. There always was music and bowls of punch were filled and refilled.

With all the parades, amusement and entertainment the thought that this was a business proposition never was allowed to be forgotten. Salesmen were kept busy bringing their prospects to the stores. That there are many hundreds of people with a desire to own an automobile and the money to buy it, who do not already own one was demonstrated repeatedly. This ordinarily pedestrian trade was attracted to the displays by motor stages which were kept parked in the business district to provide free transport to the motor car houses.

STARKWEATHER GETS SHOWROOM

Detroit, April 22—C. C. Starkweather, Buick dealer in Detroit, has absorbed the Telotte-Buick Co., which also has been one of four Buick representatives in this territory. Elimination of this company leaves Starkweather, the Harley-Buick Co., and the Buick branch in the local field. Starkweather who for some time has conducted his business from his office at Griswold and Larned streets for the time being will use the Telotte salesroom at 3766 Woodward avenue as a show room and service station. He will continue to direct his organization from his Griswold street office.

In This Issue—The Service Parts Plan

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Lincoln, Ill.	Automobile Show	April 21-29
Chicago	Used Automobile Show	May 7-15
Bangor, Me.	Automobile Show	May 9-14
Rocky Mount, N. C.	Annual Automobile Show	May 10-14
Cincinnati	Fall Automobile Show	Oct. 1-8

RACES

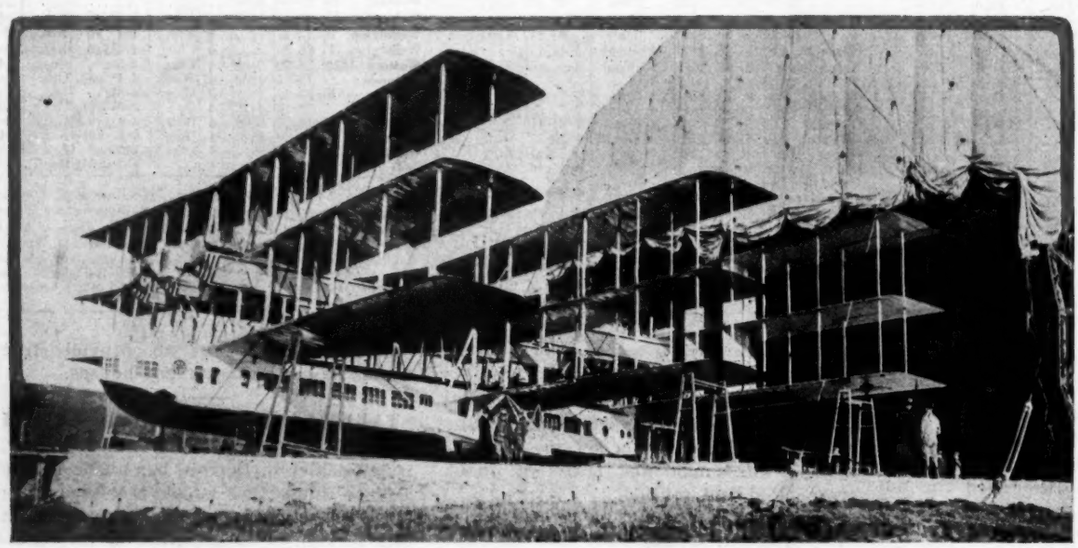
Indianapolis Speedway	500 Mile Race	May 30
Uniontown Speedway	Speedway Events	June 18
Cincinnati	Speedway Race (Possible)	July 4
Tacoma	Speedway Race	July 4
Le Mans	French Grand Prix	July 25
Elgin	Road Race (Possible)	August 3
Pikes Peak	Hill Climb	September 5
Uniontown Speedway	Annual Autumn Classic	September 5
Los Angeles	Speedway Race	November 24

FOREIGN SHOWS

Prague	Czecho-Slovak International Exposition	May 28,..1921
Basle, Switzerland	International Automobile Exhibition	May 28, June 8
Reykjavik, Iceland	Agricultural Machinery	June, 1921
Buenos Aires, Argentina	Passenger Cars and Equipment	September
Luxemburg	Luxemburg Agricultural Sample Exhibition	September
Paris, France	Paris Motor Show	Oct. 5-16
London	British Motor Show, Society Motor Mfrs. and Traders	Nov. 4-12

CONVENTIONS

Cleveland	National Foreign Trade Council	May 4-7
Newark, N. J.	New Jersey Automotive Trade Association	May 12
Buffalo	Convention of Factory Service Managers, Auspices of Service Committee, N. A. C. C.	May 17-19
West Baden, Ind.	Summer Meeting Society of Automotive Engineers	May 24-28
Mackinac Island, Mich.	Summer Meeting Automotive Equipment Association	June 20-25
Chicago	Twenty-eighth Annual Convention National Implement & Vehicle Association	Oct. 12-14



World's Largest Airplane Destroyed by Fire

The Caproni flying boat "Epocha," after being wrecked by a storm on Lake Maggiore, Italy, was destroyed by fire recently. Plans are already under way for the construction of a new machine of the same size and design. The "Epocha" was the greatest heavier-than-air machine in the world, having a passenger capacity of 100 persons. It was built for trans-Atlantic travel. The flying boat was 66 ft. long and had a wing spread of 108 ft. It had three sets of "triple wings" and weighed, unloaded, twenty-four and a half tons. It's estimated speed, fully loaded, was ninety miles an hour. Eight Liberty engines furnished the propelling power for the giant flying machine

Business Notes

The B-N line, consisting of B-N piston pins and automobile accessories, and Bur-Nor hardware specialties, will be sold to the jobbing trade in Minnesota, Missouri, Iowa, Kansas and Nebraska by H. F. Libby, of Kansas City. Mr. Libby is very well known to the buyers of that section of the country, and has had years of experience in the automotive line.

The O. K. Giant Battery Corp. has been organized and incorporated in Atlanta by F. K. Adams, F. L. Cook and J. C. Rucker to manufacture a line of electric storage batteries and possibly other automobile accessories and parts.

A new high record for net sales was established by the U. S. Rubber Co. in 1920 when the total turnover was $256,150,130, compared with $225,589,465 for the preceding year. Net profits for 1920 after interest charges were $21,220,983, as compared with $17,730,237 in 1919. The balance for the common stock was $16,002,265, which was equivalent to $19.75 a share as compared with $24.18 a share in 1919.

The Brown Mfg. Co. has been organized and incorporated at Brunswick, Ga., to manufacture a quick-change rim for automobile tires invented by Sam E. Brown, who will probably head the corporation. In its petition for charter the corporation also sets forth that it will manufacture various lines of automobile parts and accessories in addition to the rim.

The Hart-Parr Co. has distributed to its employees who were eligible under its continuity of service participation plan for 1920 checks for their share of the profits for 1920, the checks ranging from $10 to $600, according to length of continuous service. Plans were consummated at the time of the distribution looking forward to a large production of Hart-Parr tractors during the present year.

Crystal-Timers, Inc., has been incorporated at Corning, N. Y., to handle glass distributors for automobiles. The device is to be made of Pyrex glassware and will be manufactured by the Corning Glass Works.

The Allan-Diffenbaugh Wrench & Tool Co., which started operations in its new factory at Baraboo, Wis., less than five months ago, has filled original orders calling for 80,000 wrenches and is receiving forgings and other materials for a second complement of the same size. The present product consists of a patented design of self-adjustable wrench resembling in appearance a pair of pliers. The production is being sold through jobbers and is absorbed principally by garages and service stations, although many are going into private owners' hands.

The Antigo Tractor Corp., Antigo, Wis., a $1,000,000 concern which took over the original Antigo Tractor Co., has five machines in work and will place them in the hands of users by June 1. On July 1 it is planned to start quantity production, a schedule of 350 to 400 machines having been laid out for the remainder of this year by W. L. Carger, general manager.

The International Harvester Co., in its annual report, shows that despite domestic conditions in the latter part of the year and difficulties in the way of foreign trade, the company's business during the year ended Dec. 31, 1920, was greater both in the home and foreign market than any previous year in its history. Sales for the year amounted to $225,000,000, compared to $212,000,000 in 1919 and $204,000,000 in 1918. The foreign sales aggregated $60,000,000.

The Franklin Automobile Co. of Syracuse has opened its Richmond avenue body plant which has been closed since Dec. 1, and by June 1 will reach a production there of three bodies a day. Employment will be given to 100 men at the body plant.